ARCHIVES OF OPHTHALMOLOGY.

DETERMINATION OF THE PRESUMABLE REFRACTION OF THE EYE WITH AND WITHOUT ITS CRYSTALLINE LENS.

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Translated by Dr. Wm. K. Mittendorf.

(*With two text-figures.*)

It is not uninteresting to compare the refraction of an eye in possession of its lens with the refraction that it would have when deprived of it; in other words, to compute from the refraction of the complete eye that of this eye in a condition of aphakia, and *vice versa*.

The solution of this problem is not absolutely new. Many colleagues have given it in various forms, especially since the suppression of the lens has been recommended anew as a cure for excessive myopia.

Urged by some friends to make more generally known the way we follow in this calculation, we publish it here, hoping that by its simplicity and clearness it may find the approval of our learned colleagues.

A—*Computation of the Refraction of an Eye after the Loss of its Lens.*

We calculate first the *length* of the eye by means of the formula:

$$l'' = \frac{F' \times F''}{l'}$$ [1]

l'' being the difference in length between the ametropic and the emmetropic eye,[2] F' representing the first (or anterior) principal focal distance, and F'' the second (or posterior) principal focal distance of the *complete* eye (Fig. 1).

[1] Helmholtz, *Physiolog., Optik*, ii., p. 69, and Landolt, *The Refraction and Accommodation of the Eye*, p. 20 and p. 96.

[2] We suppose that, as usual, the ametropia is due to an abnormal length of the eye, its dioptric system being the same.

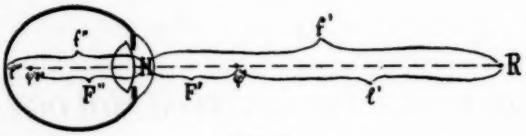

FIG. 1.

$l' = f' - F'$, that is to say, the difference between the first conjugate and the first principal focal distance of the complete eye; [where f' = the distance of the *punctum remotum* R, from the first principal point H of the eye (positive in myopia, negative in hypermetropia, infinite in emmetropia)].

When, as usual, the correcting glass of the ametropia is placed 13 *mm* in front of the cornea, it is situated just in the anterior principal focus φ' of the complete eye. The focus of this glass coinciding with the first conjugate focus R of the eye, the expression $f' - F'$ is necessarily identical with the focal distance of the correcting glass.

The first principal focal distance of the complete eye, F', is, according to Helmholtz, equal to 15.5 *mm*. The second principal focal distance of the complete eye, F'', is equal to 20.7 *mm*.

Therefore $F' \times F'' = 321$ *mm*.

If the correcting glass in φ' is = 1D, then $l' = 1000$ *mm* and

$$l'' = \frac{F' \times F''}{l'} = \frac{321}{1000} = 0.321 \text{ mm}$$

That is to say: if the correcting glass is placed in the anterior focus of the eye, each dioptry corresponds to a difference in the length of the eye of 0.321 *mm*—a lengthening, if the correcting glass is *concave* (myopia); a *shortening* if it is *convex* (hypermetropia).

A myopic eye, corrected by concave 10. D in φ', is about 3.21 *mm* longer; a hypermetropic eye, corrected by convex 10. D in φ', about 3.21 *mm* shorter than the emmetropic eye.

Vice versa, if we put $l'' = 1$ *mm*, then l' becomes 321 *mm*; that is to say, a change in the length of the eye of 1 *mm* requires a correcting glass of 321 *mm* focal distance or

$$\frac{1000}{231} = 3.1 \text{ D},$$

when it is placed in the anterior focus of the complete eye.

An l'' of 5 *mm* would, for instance, indicate $5 \times 3.1 = 15.5$ *negative* dioptries (*concave* glass), when the eye is *lengthened* 5 *mm* (M); *positive* dioptries (*convex* glass), when the eye is *shortened* 5 *mm* (H).

The *length of the ametropic eye* is equal to the length of the normal eye, L, + or − l″.

According to Helmholtz, we put this L = 23.8 *mm.*

In APHAKIA, *where the cornea presents the only refracting surface, the length of the eye is identical with the posterior conjugate focal distance* f″. Therefore, we may say

$$f'' = L \pm l'' \text{ (Fig. 2)}$$

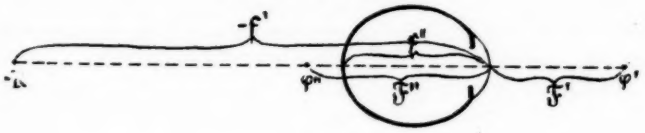

FIG. 2.

We have then to calculate the anterior conjugate focal distance f′ that corresponds to this f″. This we do by the aid of the following formula:

$$f' = \frac{f'' \times F'}{f'' - F''}$$

wherein F′ = anterior principal focal distance of the aphakic eye = 23.26 *mm.*

F″ = posterior principal focal distance of the aphakic eye = 31 *mm* (according to Helmholtz).

If the correcting glass of the aphakic eye is placed 13 *mm* in front of the cornea, then its focal distance l′ must evidently be

$$f' \pm 13 \text{ mm.}^1$$

EXAMPLES.

I. Example.—What will become the refraction of an emmetropic eye of 23.8 *mm* in length, after removal of its lens?

We put the corresponding values in the above formula and find

$$f' = \frac{23.8 \times 23.26}{23.8 - 31.} = \frac{554}{-7.2} = -77 \text{ mm};$$

f′ is therefore a *negative* value; that is to say, the first conjugate focus of the eye, *i. e.*, its *punctum remotum* R, is on the same side as the second focus (the retina). The eye is then *hypermetropic.*

To see in the distance distinctly it requires a *convex* glass. If

[1] This point has, of course, no longer a special significance as in the complete eye, of which it represents the anterior focus. The anterior focus of the aphakic eye lies, as said, 23.26 *mm* in front of its cornea.

placed in contact with the cornea, this correcting glass should have a focal distance of 77 *mm*, *i. e.*, 12.98 D; 13 *mm* in front of the cornea, farther away from R, its focal distance would be 77 + 13 = 90 *mm*, and its refraction 11.1 D.

This agrees pretty well with practical experience, according to which an emmetrope, after the operation for cataract, requires a convex glass of about 11. D to see distinctly in the distance.

II. Example.— A complete myopic eye requires, for its correction, − 20 D, placed in its anterior focus. l′ is therefore = 50 *mm*.

So f′ = 50 + 15 = 65 *mm*. (If we would count the distance of the *punctum remotum* from the principal point H, this would represent a myopia of 15 D.)

What will be the refraction of this eye, after loss of the lens?

$$\text{Since } l' = 50\ mm,\ l'' = \frac{321}{50} = 6.4\ mm.$$

Therefore the length of the eye f″ = 23.8 + 6.4 = 30.2 *mm*.

To this f″ corresponds an f′ of

$$f' = \frac{30.2 \times 23.26}{30.2 - 31} = \frac{702.652}{-0.8} = -878.3\ mm.$$

That is to say, the second conjugate focus of the eye is *negative*; the eye is *hypermetropic*, and would require a *convex* correcting glass of 878 + 13 = 891 *mm*, or 1.1 D, if this glass be placed 13 *mm* in front of the cornea.

This is, it may be said in passing, an important practical result. It shows that, should we be tempted to procure for a myope the privilege of seeing in the distance without glasses, we may offer this gift at least only to myopes of more than 20 D, else they will see without glasses neither near nor far, if they continue to see at all after the operation.

III. Example.—We may ask generally: How strong must a myopia be, that we may expect to change it into emmetropia by the removal of the lens? The length of such an eye must evidently equal the second principal focal distance, F″, of the aphakic eye, that is, 31 *mm*.

How strong is the myopia of such an eye in possession of its lens?—We have seen above that every millimetre of difference in length (l″) between a complete emmetropic eye and a complete ametropic eye represents a correcting glass, placed 13 *mm* in front of the cornea, of 3.1 D.

In our example, l″ becomes equal to 31 − 24 = 7 *mm*. The

correcting glass in φ' would therefore be $7 \times 3.1 = 21.7$ D, that is, almost 22 D refracting power.

If we took f′ as the expression of the refraction of the eye, that is to say, if we counted the distance of R from the principal point, the myopia would be

$$\frac{1}{f'} = 16.4 \text{ D.}$$

B—*How to Calculate the Probable Refraction of a Complete Eye, from the Known Refraction of the Aphakic Eye.*

For this purpose, we use, evidently, the same formulæ as above, only therein are f′, F′, and F″ known, and f″ sought.

IV. Example.—Let the glass, placed 13 *mm* in front of the cornea, be a *convex* glass of 8 D. Its focal distance is 125 *mm.* What was the refraction of this eye before the loss of its lens?

The first conjugate focus lies, evidently, *behind* the eye, its first conjugate focal distance f′ is *negative*, and is $125 - 13 = 112$ *mm.*

From this value we deduce f″, that is, the *length* of the eye. We do so by the aid of the formula

$$f'' = \frac{f' \times F''}{f' - F'}$$

Since f′ is negative, the formula takes the following form:

$$f'' = \frac{f' \times F''}{f' + F'}$$

Substituting for the letters their respective values, we have:

$$f'' = \frac{112 \times 31}{112 + 23.26} = 25.5 \text{ } mm.$$

This eye exceeds the length of the normal eye (23.8 *mm*) by 1.7 *mm* (1″); and, as to each millimetre correspond 3.1 D of the correcting glass placed in the anterior focus, this eye, in possession of its lens, needed a glass of 5.3 D. This glass was a *concave* one, as the eye is longer than the normal eye—in other words, the eye was *myopic.*

In order to simplify the computation, for practical use, let us consider the formula

$$l'' = \frac{F' \times F''}{l'}$$

where l″ is again the difference in length between the ametropic and emmetropic eye.

l' is the focal distance of the correcting glass, placed in the anterior focus (φ'). Its value in dioptries is therefore

$$l' = \frac{1 \text{ metre}}{l'}$$

F' and F'' are the principal focal distances of the eye.

If we put $l'' = 1\ m$, l' becomes $= F' \times F''$.

In the complete eye, $F' \times F'' = 321\ mm$.

$$\text{therefore } \frac{1}{l'} = \frac{1000}{321} = \text{about } 3 \text{ D.}$$

In the aphakic eye $F' \times F'' = 721\ mm$.

$$\text{therefore } \frac{1}{l'} = \frac{1000}{721} = \text{about } 1.4 \text{ D.}$$

In other words, the difference in length of the eye has, in the complete eye, about double the influence upon the correcting glass placed in the anterior focus that it has in the state of aphakia.

One millimetre difference means in the former about three dioptries, in the latter hardly one dioptry and a half.[1]

On the other hand, a difference of 1 D in the correcting glass of the *aphakic* eye indicates about *double* the difference in the *length* of the eye that it does in the *complete* eye.

Now we have seen that an emmetropic eye, after loss of its lens, requires a correcting glass of 11 D, placed 13 *mm* in front of the cornea.

An eye 2 *mm* longer needs, in possession of its lens, a *concave* glass of $3 \times 2 = 6$ D; in a state of *aphakia* not $11 - 6 = 5$ D, but $11 - 3 = 8$ D, because the 2 *mm* do no longer exert but half the influence upon the required correcting glass.[2]

Then it is not, as one thought formerly, a myopia of 11 D, but one of 22 D, that becomes emmetropia after removal of the lens.

A *myopia* of 26 D would not become one of $26 - 11 = 15$ D, but of $13 - 11 = 2$ D.

The same holds true for *hypermetropia*. A hypermetropia, corrected by convex 6 in φ', will not require, after removal of the lens, convex $11 + 6 = 17$ D, but only $11 + 3 = 14$ D.

[1] See Hirschberg, "Über Verminderung der Kurzsichtigkeit durch Beseitigung der Krystallinse," *Centralblatt für Aughlkd.*, 1897, p. 65.

[2] The correcting glass, as reckoned for aphakia, must be in the anterior focus of this eye, that is, 23 *mm* in front of the cornea. If it is placed in the same place as in the complete eye, *i. e.*, 13 *mm* in front of the cornea, then it must be, if concave, a little weaker, if convex, a little stronger, than would result from the above deduction.

In general, to compute the **probable** correcting glass, after loss of the lens, one divides by 2 the number of dioptries of the correcting glass of the complete eye, and, when *concave*, *subtracts* it from 11 D; when *convex*, *adds* it to 11 D.

On the other hand, though a correcting glass of + 11 D in aphakia indicates a former emmetropia, we cannot conclude, from convex 14, a hypermetropia of $14 - 11 = 3$ D, but one of $2 \times 3 = 6$ D, since the shortening of the axis, which, in the aphakic eye, exerts only an influence of 3 D upon the correcting glass, exerts one twice as great upon it in the complete eye.

We know that an eye, which has become emmetropic after loss of the lens, needed a former — 22 D to correct its myopia; but one that, after the extraction, needs — 1 D, had formerly needed not $22 + 1 = 23$ D, but $22 + 2 = 24$ D, to see well in the distance with.

To give the whole a simple and concise expression, let us call:

c = the *correcting glass* of the *complete* eye,

a = the *correcting glass* of the *aphakic* eye, and we may put:

$$c = 2\,(a - 11);\ \text{or}\ c = 2a - 22$$

$$a = \frac{22 + c}{2};\ \text{or}\ a = 11 + \frac{c}{2}$$

Wherein + means a *convex*, — a *concave* correcting glass.[1]

[1] Compare on the same subject the following publications: Eperon, "De la correction opératoire de la myopie forte," *Arch. d'opht.*, 1896, p. 750; A. Stadfeldt, "Die Veränderung der Refraction nach Extraction der Linse," *Monatsbl. f. Aughlkd.*, March, 1896; and Ostwalt, "Beitrag zur Dioptrik des Auges," *Arch. f. Ophth.*, p. 44, 1897, and Hirschberg, "Über Verminderung der Kurzsichtigkeit durch Beseitigung der Krystallinse," *Centralblatt f. Aughlkd.*, 1897, p. 65.

TRANSPLANTATION OF A LARGE WOLFF GRAFT, FORMING A NEW LINING OF THE ORBIT, AND PERMITTING THE WEARING OF AN ARTIFICIAL EYE.

By Dr. CHARLES H. MAY, New York,

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IT is generally conceded as being very difficult to restore the socket, after enucleation of the eyeball, when this cavity has lost its conjunctival lining and has become filled with cicatricial tissue. Until recently the re-establishment of such a cavity, so that an artificial eye could be worn, was considered hopeless. The following report is therefore instructive and interesting. The patient presented a shrunken and almost obliterated socket. After dissecting out a new cavity, a large Wolff graft was used to reline it. The operation was entirely successful, and the patient is now wearing an artificial eye of good size, with excellent cosmetic effect.

Miss A. C., age thirty, a native of Canada, presented herself in January, 1901, and gave the following

Previous History.—At the age of four she suffered from scarlatina and diphtheria; the right eye became involved, and as a result there was perforation of the globe with escape of its contents. The shrunken eyeball was quiescent until the age of fifteen, when it became painful and inflamed, and was removed. This operation must have been a very radical procedure, for examination of the parts removed, which the patient had preserved, showed, besides the globe, large masses of muscle and connective tissue. After this operation an artificial eye was worn with comfort.

Ten years later, when the patient was twenty-five, a growth

appeared upon the inner aspect of the lower lid (probably a granuloma), which prevented the wearing of the artificial eye for four or five months; this growth was then removed and the prothesis could again be worn. Five years later (August, 1900) considerable granulation tissue made its appearance, and the conjunctival sac began to shrink so that a reduction in the size of the artificial eye became necessary. This condition was treated with nitrate of silver, chromic acid, followed by the electro-cautery and division of cicatricial bands with the knife. A very small artificial eye was placed in the orbit, but a week later the lids became swollen and reddened, and the artificial eye could not be retained. This ended the treatment which she received in Canada, and she was told that nothing more could be done. Subsequently there was additional shrinking.

Examination before Operation.—The orbit of the right side is undeveloped and measures 1⅝ by 1¼ inches; on the left side the measurements are 1⅝ by 1⅝ inches. The palpebral aperture measures one inch on the right side and 1¼ inches on the left. On separating the lids of the right eye each is found to be lined by normal mucous membrane to the extent of ⅛ of an inch from the ciliary margin. Joining this limited mucous covering there is a linear cicatrix extending the entire width of the orbit, and binding down the lids, so that there is absolutely no space for even the smallest artificial eye. This cicatricial, horizontal band is dense, and presents nodular enlargements at various points. Upon palpation, it is found to extend backwards into the depth of the orbit. There are numerous other cicatricial bands passing in various directions.

Operation, February 8th.—Nitrous oxide, followed by ether anæsthesia. The horizontal strip of cicatricial tissue was excised, leaving the mucous membrane lining the marginal portions of the lids to the extent of ⅛ inch intact. With blunt-pointed scissors and the handle of a scalpel *an artificial cavity was made* between the lids, extending into vascular connective tissue, and freely severing all cicatricial bands. This was enlarged to the fullest extent possible, and finally was large enough to admit the distal phalanx of the thumb. *Salt solution* (¾ *per cent., sterilized*) was used in irrigating and mopping during the progress of the operation. The artificial cavity having been packed with sterilized gauze, the next step was the *preparation of the skin-graft.*

The outer portion of the thigh on a level with the groin was

selected as presenting an area devoid of large veins, with delicate skin, and free from any but the very finest hairs. Two curved incisions were made so as to enclose *an elliptical piece of skin* measuring three inches in length, an inch and a half at the widest part, and tapering toward each extremity. This area had previously been scrubbed with soap and water, and then with ether. The incisions were made *throughout the entire thickness of the skin* down to the subcutaneous fat, and the graft removed. The latter was transferred to a *warm salt solution* ($\frac{3}{4}$ per cent.), and while immersed in this was cleansed from adherent fat and connective tissue. During this trimming process the flap shrank fully one third.

The next step was the selection of a proper *support for the graft*—one which would fill out the newly made cavity. About twenty hollow pieces of porcelain of various sizes had been provided; some of these were of the shape of the new Snellen artificial eyes, some almond-shaped, some olive-shaped. From this collection, one of olive shape, $\frac{3}{4}$ inch in length and $\frac{1}{2}$ inch in thickness, was found to fill out the cavity, and was selected.

Bleeding in the orbit having ceased, the skin-graft was wound around the porcelain support, the connective-tissue surface external, and introduced into the cavity, care being taken that it was pressed deeply into the orbit. Superfluous skin was trimmed off at the margins of the graft; allowance was made for the subsequent shrinking, and hence very little trimming was required.

There was now a *complete lining to the orbit*, filled out by the olive-shaped porcelain support. Six delicate *silk sutures* were passed between the free ends of the skin-graft and the remnant of mucous membrane attached to the marginal portion of both lids, and the sutures tied.

A thick layer of absorbent cotton, wet with sterilized saline solution, was applied to the closed lids; next a layer of gutta-percha tissue, then a mass of dry cotton, and finally a bandage which covered both eyes.

The defect in the upper part of the thigh from which the graft had been removed, was obliterated in the following manner: It could not be effaced by undermining the edges and bringing the margins together; since there was a thick layer of fat in this situation, this was exsected and then the margins of the defect were approximated and held in place by strong silkworm sutures, passed deeply, and a line of superficial silk sutures; this wound healed promptly.

February 10*th.*—The bandage was removed and the lids inspected; the latter were slightly swollen and reddened, but there was very little reaction. The lids were not disturbed. A dressing such as was used at the time of the operation was applied and then a bandage covering the operated eye only.

February 13*th.*—The bandage was removed daily and the outside of the lids cleansed; scarcely any reaction.

February 14*th.*—The lids separated gently; the graft securely in place; rebandaged.

February 18*th.*—The lids have been cleansed and a wet dressing reapplied daily. The porcelain support was removed for the first time. It escaped without any difficulty and was easily replaced; there is a large cavity lined with the new skin; the latter is of a pink color and appears to have united to the deeper parts; there is considerable desquamation of the epidermis. The silk sutures attaching the graft to the ciliary portion of the lids were removed.

February 22*d.*—The eye is dressed daily, the porcelain support being removed each time and the cavity of the eyeball irrigated with warm salt solution. A dry dressing is substituted for the wet one. The graft is becoming red and succulent. There has been no pain or inconvenience at any time, and no elevation of temperature.

March 1*st.*—There is now considerable swelling of the newly lined sac, and the porcelain support is not retained as well as formerly.

March 10*th.*—The swelling of the graft has increased. There are large granulations at the junction of the graft and the mucous membrane remaining at the ciliary portion of the lids. On account of these and the swelling of the graft, there is considerably less space in the sac; a smaller porcelain support had to be substituted.

March 20*th.*—Condition is the same. A few of the granulations above alluded to were excised. The cavity is small compared with its size immediately after the operation. Dressing changed daily.

April 1*st.*—The granulations are becoming smaller in size, and the graft is less swollen. A large support is retained. There is considerable desquamation of epithelium.

May 1*st.*—Dressing changed daily. There has been a gradual increase in the size of the cavity; the granulations have disap-

peared. The portion of the graft covering the ciliary part of the lids has changed its appearance and now resembles mucous membrane. A good-sized Snellen artificial eye can now be worn. The bandage is omitted.

Result, May 20th: The operation has been entirely successful in *restoring the lining of the orbit and supplying a cavity of adequate size.* The patient can wear, with perfect comfort, a good-sized artificial eye—larger than she has been able to wear at any time since the enucleation of her globe fifteen years before. Most of the cavity is lined with skin which has changed its original appearance and now resembles mucous membrane. In the depth of the cavity the graft still has the appearance of integument. In this situation a curious change has presented itself: When a place for supplying the graft was chosen, the outer part of the upper portion of the thigh was selected, since there was an absence of any but the very finest hairs in this situation; as a result of heat and moisture, probably, the fine hairs situated in that portion of the graft which corresponded to the depth of the orbit, have taken on increased growth, so that now a number of hairs, half an inch in length, are seen; these do not, however, interfere in any way with the wearing of the artificial eye. There is comparatively little discharge, and this is free from odor. This case demonstrated the possibility of transplanting a large graft, by the Wolff method, and of utilizing this for a permanent covering.

The relative measurements of the orbit and palpebral aperture of the two sides, given above, indicate the effect produced upon the development of the orbit by atrophy of the globe and subsequent enucleation in early life. Notwithstanding this diminished size of the orbit the cosmetic effect of the prothesis is excellent.

As bearing upon the question of the *permanency of grafts* used to replace cicatricial tissue of the orbit, the writer adds the histories of two cases in which Thiersch grafts were used to replace lost conjunctiva.

The first of these was reported in the ARCHIVES OF OPHTHALMOLOGY for April, 1899, under the title: "Restoration of the Conjunctival Cul-de-sac in a Case of Total Symblepharon,

by Means of Thiersch Skin-Grafts." In this case the symblepharon was so complete that lids and eyeball were kept in one position, so that the lids could neither be closed nor opened beyond the space represented by the free portion of the globe; this had resulted from a burn produced by lime. This patient was operated upon in May, 1897, four years ago. A number of large Thiersch skin-grafts were used; these were kept in place by a porcelain shell resembling an artificial eye. At this date, four years after the grafting, the effect is as perfect as it was immediately after the operation. The new lining of skin has proved durable and efficient, and the patient is wearing an artificial eye with excellent cosmetic effect.

Another case, not previously reported, occurred in a mason, A. H., aged thirty-one, who had an extensive symblepharon due to a burn from lime. The adhesion between the lower lid and the cornea caused considerable irritation, since it restricted the movements of the globe. After unsuccessful attempts to relieve the condition by older methods, the writer divided the symblepharon freely and placed a large Thiersch graft over the defect thus made. The graft was kept in place by being supported upon a porcelain shell, resembling an artificial eye in shape, and, in addition, it was stitched to the margins of the raw surfaces by delicate sutures. A wet dressing was applied and then a bandage. Although the supporting shell covered the cornea, which was normal and transparent over two thirds of its area, it was well tolerated. The graft adhered promptly, and the symblepharon was cured. This patient was operated upon in April, 1899. He was kept under observation for fifteen months; at the end of this period (he was last seen in July, 1900), the effect of the operation had not diminished; the new lining seemed permanent.

The author desires to acknowledge his indebtedness to W. T. Georgen, of 32 East 23d Street, for his courtesy in supplying a large number of porcelain supports.

OCULAR AFFECTIONS IN CASES OF XERODERMA PIGMENTOSUM (EPIBULBAR CARCINOMA) IN A BOY OF SIX YEARS.

By Prof. R. GREEFF, Berlin.

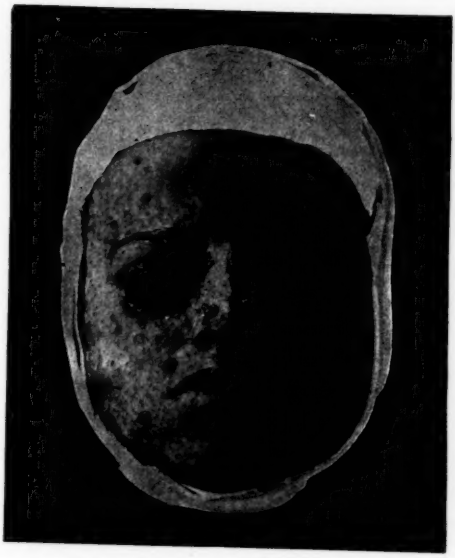
(*With four illustrations on Plates VI.–VII. of Vol. XLII. German Edition, and Text-Plates V. and VI.*)

Translated by Dr. Ward A. Holden.

FEBRUARY 22, 1899, Albert P., aged six, was brought to the Charité on account of a growth on his right eye. The eye was wholly covered by a rose-colored tumor as large as a chestnut, yet one saw at a glance that the affection was not merely a local one of the eye but a diffuse skin disease. The boy, in fact, presented a remarkable picture. All the visible parts of the body—face, neck, and hands—were thickly covered with large and small brown or black patches which were rarely quite flat, but were more frequently elevated, and at many points formed thick nodules. On the parts of the body covered by the clothes the patches and nodules gradually diminished in number and finally disappeared altogether. But when a rent in the clothes let the light through, black patches or a beginning of them could be seen. It was clear that the lesions developed only under the influence of light. Professor Lesser diagnosed the case as one of xeroderma pigmentosum.

March 3d an elder brother of the patient was admitted who presented the lesions in a higher degree than the younger patient.

Since this is a disease which is of interest in more than one respect a detailed description is justifiable; and I offer



A. P., AGED 6.

this rather in a journal for ophthalmologists, since almost all of the cases previously described have presented noteworthy ocular affections of which but little has been written in ophthalmic literature.

The histories of the two boys are as follows:

1. Albert P., aged six, the son of a laborer, was admitted February 22, 1899. Diagnosis: Xeroderma pigmentosum, epibulbar carcinoma of the right eye.

History.—The mother is forty-three, the father forty-four, both healthy. The grandparents are healthy, and there is no family history of skin disease. No consanguinity. There are six children, ranging in age from fifteen years to four years. All are healthy except our two patients. The youngest child was personally examined by us, but no evidence of the disease was found anywhere on the body. The parents kept a pig and a goat but no cows; the children sometimes slept in a room in which potatoes were stored.

The beginning of the affection, the black discoloration of the skin of the face and hands, was noticed by the parents a year and a half ago. Two months ago a tumor appeared at the inner commissure of the right eye. This tumor has had its present size for two months.

Status Præsens. — The boy is 102 *cm* tall, poorly developed for his age, bones slender, the shin bones slightly curved outward, but no other abnormalities of the skeleton.

Temperature 37°, pulse 96. The two upper incisors are poorly developed, but not of the Hutchinson type. A few enlarged glands.

The skin of the face, throat, neck, ears, backs of the hands, the extensor surface of the upper arms as far as the shoulder, the back of the feet and legs up to the knees, present similar changes, which are most marked on the face. Here one sees numerous freckle-like spots, some elevated, some flat, rarely red but mostly brown or black. Between them are lighter colored, almost white, areas of skin. Here and there are telangiectasias. The skin, on the whole, is smooth, lustrous, and dry.

In the region of the nose are many wart-like elevations, some as high as 6 *mm.* On the neck the changes in the skin gradually diminish and disappear at the level of the clavicles.

On the backs of the hands the spots are found in great number, but on the extensor surface of the arms are less conspicuous.

The backs of the feet and the lower parts of the legs present some pigment spots, and the child states that he went barefoot always in the summer.

The soles of the feet, palms of the hands, and the other parts of the body not described are practically free from the spots.

The mucosa of the lips and gums exhibits the changes, but the tongue is not affected.

In the left palpebral conjunctiva are isolated enlarged follicles, with general redness and swelling and moderate secretion.

The right palpebral aperture is almost entirely filled with a tumor about the size of a walnut. Its surface is granular, partly covered with crusts, and the free red portions secrete a thick pus. The tumor is red and presents no pigmentation. It is hard and nowhere movable over the underlying tissues, but it moves with the eyeball.

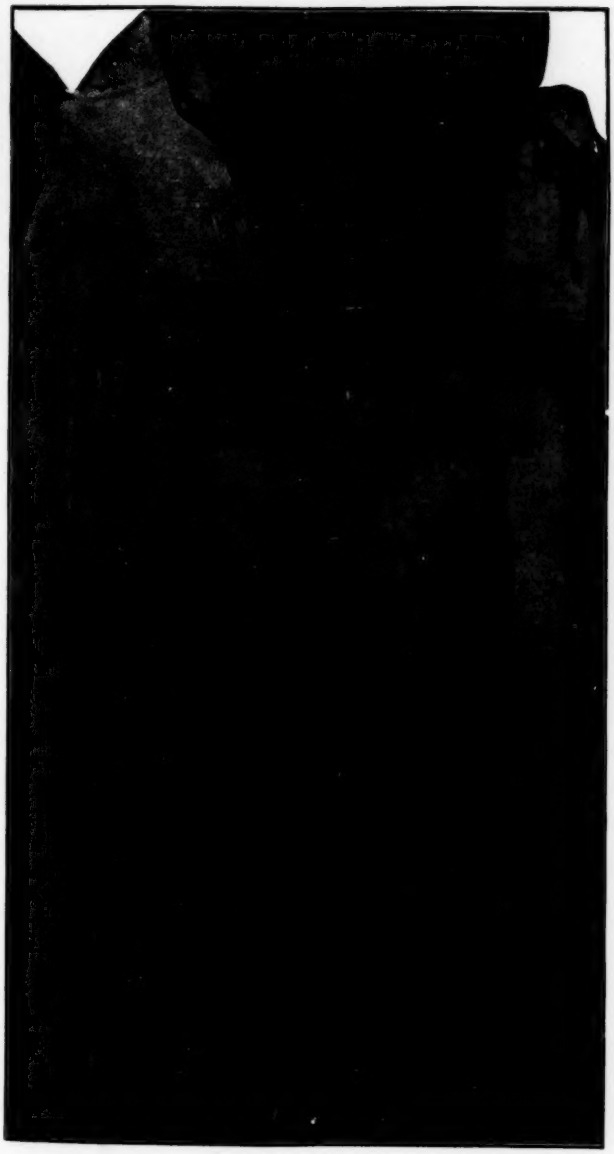
In narcosis it was found that the tumor was limited to the scleral conjunctiva and a portion of the cornea, and rises with steep margins. It nowhere overhangs its base, and a probe cannot be passed between it and the ball. Nor does it at any point extend to the palpebral conjunctiva or the lids themselves. Externally a portion of the cornea 3–4 *mm* wide is visible and has its natural form, although it is slightly cloudy.

An examination in the nervous department revealed no disturbances of sensation or ataxia. Urine normal. March 3d, 1899, the eye was enucleated with the tumor which had extended neither to the lids nor into the depth of the orbit.

2. Paul P., aged eleven, an elder brother of the other patient, was admitted March 3, 1899, with the diagnosis xeroderma pigmentosum with carcinoma on the bridge of the nose.

The patient was said to have been born with normal skin, the affection having first been noticed by the parents a year and a half before.

Status Præsens.—The same cutaneous changes, particularly the black spots surrounded by white, that were found in the first case, were observed in this on the face, throat, neck, forearms, upper arms on the extensor surface, backs of the hands, and legs up to the knee. The palms of the hands and soles of the feet were free. Lymphatic glands palpably swollen. At the back of the neck a granulating ulcer as large as a ten-cent piece. It was stated that two weeks before a tumor as large as a walnut had been removed from this spot. The surface of the tumor presented



PAUL P., AGED 11.

many clefts. The tumor began to grow in December, 1898. On the face are 15 to 20 warty nodules, the largest one, the size of a bean, on the right ala of the nose. Otherwise the skin was affected similarly to that of his brother. There were scattered telangiectasias and isolated pigment spots on the back.

Eyes.—The lashes were completely wanting in both eyes. Conjunctivitis and chronic blepharitis with considerable mucous secretion. Telangiectasias in the bulbar conjunctiva; left, a dark pigment spot on the sclera; right, a triangular opacity at the inner-lower margin of the cornea, with its base at the limbus and its apex extending nearly to the middle of the pupil. Teeth normal.

Examination as to sensibility and reflexes normal.

Therapeutic experiments proved as in the other case of no avail.

Description of the Eye and the Tumor.

The condition of the enucleated ball and the tumor is as follows. The ball has retained its form, the posterior segment is entirely normal, it is not enlarged in toto, and at no place is it ectatic. Anteriorly the flesh-colored tumor, somewhat resembling a chestnut in size and shape, rests on the ball. The tumor is 24 *mm* in horizontal diameter, 19 *mm* in vertical, and 11 *mm* in greatest height above the cornea. Its middle part lies over the limbus at the inner margin of the cornea, and grows thicker where it lies over the sclera and thinner where it lies over the cornea. The greater part of the cornea is covered by the tumor, which does not merely overhang the cornea from a marginal base as in the case of many epibulbar tumors, but actually is united to the underlying cornea clear to its margin. The tumor has a much-clefted surface with nodular elevations. No pigmented spots are to be seen. The outer margin of the cornea is free.

The entire ball was hardened in formal 10 % for twenty-four hours and then in alcohol of increasing strengths, and after being divided into three portions by sections parallel to the horizontal meridian it was imbedded in celloidin. The preparations were stained with hematoxylin, hematoxylin-eosin, and van Gieson's mixture.

Microscopic Examination.—The structure of the tumor is

most clearly shown in preparations stained by van Gieson's method. The picture is that of typical carcinoma (Fig. 3, Plate VI.). The surface of the tumor is covered with a thick layer of epithelium, which is directly continuous with the epithelium of the cornea, but as it arises abruptly from the cornea at the margin of the tumor it increases in thickness fivefold. Bowman's membrane is elevated with the epithelium and can be followed to the apex of the tumor. The epithelium over the tumor is not everywhere equally thick. The clefts that were visible microscopically proved to be of two sorts—in one the epithelial layer dips down and in the recess there are red and white blood corpuscles, mucoid masses, and detritus; in the other the epithelium for a short distance is wanting, and the base of the ulcer thus formed is infiltrated with round cells. To the nasal side the tumor extends back along the ball nearly to the equator. Here the epithelium ends in a layer of muscular fibres belonging to the internal rectus and in fatty tissue, the normal conjunctiva here having been cut off.

The character of the epithelium changes but slightly where it passes from the cornea over upon the tumor. The thickening involves the superficial pavement-epithelium but slightly, taking place chiefly in the middle layer of prickle cells which here and there lie superimposed to the number of 10 to 20.

The regular arrangement of the layer of basal cells is lost. It is worthy of note that the epithelium of the scleral portion of the tumor, corresponding to the conjunctiva, contains many goblet cells, while in the corneal portion these cells are wanting.

From the surface epithelium broad processes dip down close together into the depth of the tumor in its entire extent. These processes divide and join neighboring processes and give rise to a picture of nests and tracts of epithelial processes, between which are fields of other structure and tracts proceeding from the depths. The network of epithelial processes is more coarsely meshed near the surface. In the middle processes are some detached pearl nests. The carcinoma cells in the epithelial processes have on the whole

the character of cells of the middle layers of corneal epithelium. They have a large body with angular and sometimes notched margins, and a nucleus not large and poor in chromatin. In the deeper layers in the thinner processes the cells are smaller and poorer in protoplasm, but the nuclei are mostly clearly stained. The carcinomatous proliferation extends down into the cornea and sclera. Near the nasal margin of the tumor the epithelial processes extend horizontally through the cornea, some lying just anterior to Descemet's membrane. One large process divides the cornea from the sclera completely and then turns and extends back along the sclera, breaking it up. Other processes from the sclera pass down into the adjacent choroid. The angle of the anterior chamber at the nasal side is completely blocked by tumor masses, and the meshwork of the ligamentum pectinatum is distended with an atypical proliferation in the form of nests and tracts. From the chamber angle the cells have begun to disseminate themselves through the interior of the eye, and are to be met with in the deposits on Descemet's membrane.

Malignant tumors usually in passing through dense structures like the cornea and sclera, follow the blood-vessels, and that has been the course in this case, the anterior ciliary vessels having furnished the pathway. For the most part the intima and the endothelial lining are still intact, while groups of tumor cells surround the vessel. The migration of the tumor through the sclero-corneal junction has doubtless begun in the circumvascular lymph spaces.

From the surface of the tumor numerous epithelial processes extend outward into the sclera. The outer fourth of the tumor, however, no longer extends into the sclera, but lies above it, the two being separated by the tendon and the beginning of the external rectus and fatty tissue.

Between the epithelial cones and nests of the tumor is a sparse connective-tissue stroma containing well-filled blood-vessels. Near the surface there is a dense infiltration of leucocytes, but deeper down this becomes less. It can be clearly seen that the connective-tissue stroma of the tumor proceeds from the corneal or scleral connective tissue. The

lamellæ bend about and extend up between the epithelial processes a short distance and then lose their distinctive structure and pass over into a loose connective tissue composed of fine fibres and a few elongated nuclei.

The Cornea.—The nasal third of the cornea is free from tumor growth, but it presents interesting microscopic peculiarities. Macroscopically this portion of the cornea appeared cloudy, as it appears in glaucoma, irido-cyclitis, or panophthalmitis. The cornea appeared uniformly dull and lustreless, and toward the centre was a grayish-white opacity. Microscopically the cornea presented all the appearances that Leber and Fuchs have described in œdema of the cornea. This œdema was most evident in the spaces between the epithelial cells and particularly the basal cells (Fig. 5, Pl. VI.).

Beneath Bowman's membrane and between the lamellæ of the cornea proper the lymph spaces are distended and the number of nuclei is increased. This is most evident in the lymph space just beneath Bowman's membrane, where there are many cells. Nowhere, however, have cells entered the corneal substance. In the deeper layers this abnormal increase in cells is not so manifest, but there are many distended new-formed vessels present.

Descemet's membrane is unchanged.

The endothelium shows signs of breaking down here and there, and numerous leucocytes rest upon it, either singly or in small groups, with numerous pigment granules, indicating the uveal origin of the deposits. Furthermore the entire posterior surface of the cornea is sprinkled over with red blood corpuscles. In the larger groups of cells are many large epithelioid cells, evidently carcinoma cells which have been scattered from the point of perforation of the tumor.

Anterior Chamber.—The anterior chamber is filled with a finely fibred network, due to the coagulation of an abnormally albuminous aqueous humor. A denser fibrous tract passes through the entire pupillary area, being attached to the margin of the iris at one side and to the anterior surface of the iris at the other. In the nasal angle of the anterior chamber is a large hemorrhage, behind which tumor masses project into the chamber.

Iris.—The iris is greatly swollen and infiltrated with round cells, particularly in the parts near the tumor masses. On its anterior surface are red blood corpuscles and some small deposits of lymph cells.

In the outer layers of the ciliary body, and for some distance in the choroid on the nasal side, long tracts of tumor cells are found, but they have not reached the inner margin, the pigment epithelium. The tracts have extended farthest between the lamellæ of the suprachoroidea. In the inner layers of the choroid there is a marked infiltration of round cells.

The retina contains some leucocytes in the nerve-fibre and ganglion-cell layers, and has undergone cystoid degeneration in the neighborhood of the ora serrata.

We had, thus, to do with a true carcinoma of the mucous membrane, in a boy of six. This sprang evidently from the sclero-corneal junction, the usual site, and spread over the cornea with which it is united and into which it enters deeply. At the angle of the anterior chamber it has perforated the capsule and entered the eye. The entrance of the epithelial cones into the deep-lying structures leaves no doubt as to the correctness of the diagnosis, carcinoma.

The largest of the nodules on the skin of the face and neck were removed. They had a clefted, horny surface, and at some points a black color. Microscopically the character of carcinoma was evident. On the surface was a broad horny layer with many pearl-like formations. The prickle-cell layer was broadened and the cells were arranged in nests and tracts from which cones extended into the depth, sometimes as far as the corium. Pigment was found in the rete Malpighii, and also in the corium.

Clinical.

The skin disease under consideration is a rare and noteworthy one. It has not been known long. Kaposi, in his text-book of skin diseases, in 1870, gave the disease the name xeroderma pigmentosum, and subsequently described it in detail in the *Wiener med. Jahrbuch*, 1882. Many others have written on it since, and other names have been

proposed. Altogether not many more than one hundred cases have been reported.

According to Lesser[1] the disease depends upon a congenital disposition, in almost every case reported several members of the family being affected, in one seven brothers. However, neither in our case nor in the others reported did the parents exhibit pathological conditions which could be brought into connection with the disease in the children. The children were born with a normal skin and the affection began early in extra-uterine life. Under the influence of the sun's rays there develop, on such parts of the skin as are exposed, red spots which after a short time become scaly and then disappear, but recur with every fresh exposure to the sun's rays. A diffuse redness and swelling of the affected parts sometimes develops after a few hours in the open air on a sunny day. In the typical cases there soon develop permanent changes. In what one may call the second stage, pigmentation begins. Freckle-like spots appear on the affected portions of the body, while in the intervening areas the normal pigment decreases, so that in some places large white islands appear, free of all pigment. On the whole, however, the pigmentation predominates, so that the affected portions of the skin appear, in comparison with the normal skin, spotted in brown or black.

Numerous telangiectasias appear in the next stage. The skin then becomes atrophic and smooth, and the normal furrows and folds disappear. If the skin is examined it presents a degeneration similar to that seen in old age, in the sense of an atrophy, a thinning, and a flattening of the papillæ and their epidermis.

At this time there is found at various points an atypical proliferation of the rete cones in the chronically altered cutis, hyperplasia of the sebaceous glands, and ectasia of single vessels. Thus the conditions are favorable for the last stage of the disease, that of the multiple formation of carcinoma. There appear here and there wartlike elevations which sometimes almost cover the area involved. From a certain number of these nodules true epithelial carcinomata

[1] *Lehrbuch d. Haut- u. Geschlechtskrankheiten*, Bd. i., 4 Aufl, p. 261.

develop which are progressive, and through their ulceration or through the gradually developing cachexia, without metastases as it appears, lead to a lethal ending.

At the height of the disease the picture is so typical and characteristic that everyone who has seen or read a description of a case of this sort will at once make a diagnosis.

The mucous membranes are affected in the same way as the skin. In our patients, both in the early and the late stages of the disease, red spots and pigmented patches were observed on the mucous membrane in the mouth, on the lips, and the hard and soft palate, and on the conjunctiva all stages were seen from red spots to carcinoma.

The ocular affections are apparently very characteristic of all cases of xeroderma pigmentosum, and one can even say that the eyes are a site of predilection for carcinoma formation. There are numerous accounts of the ocular symptoms in the literature, though usually brief. Some of these may be cited here.

Lubasiewicz[1] describes the condition of the eyes as follows in his first patient, a child of three and a half years. In the right eye the lower lid has lost its lashes and is drawn down and out by shrinking of the skin. The upper lid has a few lashes. The conjunctiva is injected. The left eye is invisible, the two lids being covered with a new growth. The growth begins at the inner commissure, spreads over the bridge of the nose, and entirely takes the place of the lower lid. On the upper lid it extends to the outer third. It is a fungus-shaped tumor with a broad base and a slate-gray color. In its central portion are clefts with secretion, and at its periphery bloody crusts. The plica semilunaris was involved, but the eyeball was still movable. There was an ulcer of the cornea, and the iris was bound down.

In his second case, a woman of twenty-five developed a carcinoma of the conjunctiva.

In his fifth case the disease began, in the second year of life, on the hand, at the angles of the mouth, and finally at the commissures of the eyes. When seen at the age of thirteen there was an area the size of a dollar over the zygomatic process, where the skin was red, dry, and scaly. Within this focus were numbers of small spots of atrophy of the skin.

[1] *Arch. f. Dermatol. u. Syph.*, xxxiii., 1895.

Lesser[1] described ocular changes in his first case. A girl of four with xeroderma pigmentosum showed two tumors of the face. One of irregular shape rose fungus-like from the left lower lid. It had a red, irregular surface and was hard to the touch. In both eyes the conjunctiva of the lids was greatly reddened and swollen, while the conjunctiva of the balls and the cornea were free. The tumor was removed and a plastic operation performed.

In Lesser's third case, the patient being a man of twenty-three, there were two infiltrated places on the face, one just beneath the right eye being as large as a cherry, while a smaller one was on the ala of the nose. The conjunctiva of each eye was congested, and on the left sclera near the cornea was a peculiar yellowish-white growth of uneven surface and of epithelial character.

Kaposi[2] presented to the Vienna Dermatological Society in 1894 a girl of thirteen. On the back of the hands the epidermis was red and wrinkled, and at some points lustrous, white, and scar-like. The same appearance was observed on the forehead and the right lower lid. To the finger the affected places gave the impression of a dry seborrhœa.

Graf[3] described a case with typical cutaneous changes in a boy of seventeen. The right upper lid was thickened, and there was a defect in the epithelium of its margin. The right lower lid was transformed into a tumor 3 *cm* long and 4 *cm* broad. Yellowish-brown crusts covered the tumor in its entire extent, and the eye could not be opened spontaneously. There was extensive opacity of the cornea. The left upper lid was reddened and slightly thickened, while the left lower lid was transformed into a tumor 4 *cm* long and 3 *cm* broad.

Wesalowski[4] described two cases. In the first, a boy of five had beneath the left lower lid a dark-colored tumor as large as a plum. Out and down from the right external commissure was a tumor, smaller and free from pigment. In his second case the ocular symptoms were conjunctivitis, photophobia, and pigmented spots on the lids.

West presented to the London Dermatological Society, Jan. 8, 1896, a girl with typical xeroderma pigmentosum, which appeared first on her face in her second year. In her eighth year a small tumor appeared on the right lower lid near the inner commissure,

[1] *Charité Annalen*, 1898.
[2] *Arch. f. Derm. u. Syph.*, xxviii., 1897.
[3] *Arch. f. klin. Chirurg.*, iv., 1897.
[4] *Centralbl. f. allg. Pathol. u. path. Anat.*, x., p. 990, 1899.

causing slight ectropium and a mild conjunctivitis. It grew rapidly and was removed by operation.

S. Mendes da Costa,[1] of Amsterdam, described a case seen in a peasant of twenty-one, whose sister had died after suffering sixteen years with the same disease. Nine years before, warty tumors appeared beneath the eyelids, and later spread over the rest of the face and the hands. A tumor of the sclera led to irregular astigmatism with reduction of vision to perception of light.

Lassar,[2] on July 4, 1900, showed a man of twenty-five, with xeroderma pigmentosum to the Berlin Medical Society. The right eye was wholly covered by a tumor. The patient came from a family afflicted with this disease.

The ocular affections in xeroderma pigmentosum are found both on the skin of the lids and the mucous membrane of the eye, the palpebral and bulbar conjunctiva. The first evidences of the disease appear on the face, and particularly on the lids. After a feeling of burning of the skin, with subsequent scaling, an atrophic process develops, with areas of pigmentation. It is noteworthy that even in an early stage of the disease the lashes usually fall, as was found in our case. This occurs in other diseases, such, for example, as lepra, almost regularly. At a later stage from the freckle-like spot there develop elevations of a warty appearance, whose epithelial processes finally begin to extend into the depth, so that they become true carcinomas. These arise from the lids more frequently than from the ball itself.

A very peculiar tumor of the lid in a case of xeroderma pigmentosum was described by Hanke.[3] It was on the right lower lid of a man of twenty-two, and was as large as a pea. The tumor consisted almost exclusively of vessels of large and small calibre, forming a network in which groups of cells with a large nucleus were scattered. A number of the vessels were blocked by thrombi. The author called the tumor a perithelioma. The telangiectasias found in this disease are, according to Kaposi, of a secondary nature, arising in consequence of the wasting of the vessels distributed to the atrophic spots, just as telangiectasias develop about other

[1] *Deutsche med. Wochenschr.*, 1899. *Lit. Beilagen*, p. 162.
[2] *Berl. klin. Wochenschr.*, No. 33, p. 710, 1900.
[3] *Virchow's Archiv*, ciii., p. 428.

scars. The author believes that the origin of the peritheli-oma may be traced to such telangiectasias.

The conjunctiva appears to be normal in most cases, but when carefully examined, the initial stage of the disease may be found here. This was true of our cases, and in Case 1 there was also a huge carcinoma.

A noteworthy fact in connection with this disease is that in early childhood carcinoma may develop, a neoplasm which usually occurs only in advanced age. This fact is explained when we take the other symptoms into considera-tion, and also by the nature of the disease. Lukasiewicz particularly has pointed out that the skin in the affected spots undergoes an atrophic process, a thinning and flatten-ing of the papillæ and their epidermis, which corresponds to the normal process taking place in persons of seventy or eighty. Arnogera suggested in 1888 that the essence of the disease was a senilitas præcox of the skin. This suggestion has been accepted by others, and it fits the disease abso-lutely. The injuries of the skin, the atrophy, pigmentation, and proliferation of epithelium, which in normal persons come on under certain circumstances after the skin has been exposed for seventy or eighty years to the air and light, appear in children with a congenital weakness of the skin after these external irritants have acted for some months only. For these reasons the parts exposed to the sunlight are first affected, and the parts that are covered remain normal, or nearly so. In the beginning of the disease the symptoms grow less marked or disappear as winter comes on, and advance rapidly in the spring.

The prognosis is bad and most of the patients die at an early age of multiple carcinoma. There are exceptions how-ever. Dubois-Havewith[1] reported the case of a man with xeroderma who had three healthy children. A patient of Kaposi's was fifty-nine years old. Riehl's patients had car-cinomas develop at the age of six and yet lived to be sixty-one. Hexheimer and Hildebrand also dispute the usual view, that xeroderma soon leads to death. They report the case of a patient who lived to be seventy, and of another, a

[1] *Hygiea Festband*, No. 3, 1899.

child of five, who lived after many of the carcinomas had been extirpated.

Therapy has no influence upon the disease. All efforts in this direction have proved unavailing. We tried all sorts of applications and dressings on one half of the body, but weeks later there was no perceptible difference in the appearance of the two sides. When carcinomatous tumors develop one should attack them surgically provided they are not too numerous.

In June, 1900, the family of our little patients was visited at its home in order to learn its subsequent history. The elder of the two patients had died in the spring of an apoplectic attack. It was stated that he gradually grew weak and tired, and finally slept the whole day or sat idle like an old man. At last he became too weak to raise his arms and had difficulty in feeding himself. Then he had a hemiplegia of sudden onset, followed by three other attacks. The last attack paralyzed the other half of the body and he died two days later. No new ulcers or growths had appeared. It would not seem that he had died from carcinomatosis or from metastases but rather from senilitas præcox. No autopsy was made.

The younger patient, whose eye we had enucleated, still was living and cheerful. In the spring the right eye began to suppurate and now there is phthisis. There has been no recurrence on the left side, nor have the nodules in the face particularly increased. The child, though completely blind, has good spirits and finds its way about. Recently it has been noticed that he has an abnormal desire to sleep.

On this occasion opportunity was taken to examine the four remaining children. In none was there any sign of the disease, nor even freckles, and there was no particular sensibility of the skin. In many hereditary or congenital diseases which affect many members of a family there are special laws as to the number and the sex of the children affected. No laws of this sort could be discovered in our case: two brothers were healthy, and the two children affected were not even born one after the other. The patients were, respectively, the third- and the fifth-born child. This rather speaks against a congenital disposition.

I should not neglect to mention a possibility that occurred to various persons at the Charité, viz.: that since we were inclined to believe that many neoplasms were of parasitic origin it might be that xeroderma pigmentosum was due to infection. It is difficult to suggest a particular parasite which should develop under the influence of light, and the idea is, of course, purely hypothetical and perhaps less likely to be true than some of the other explanations. The parents were fully convinced that the children had been bewitched.

THROMBOSIS OF THE CENTRAL ARTERY OF THE RETINA, PRESENTING THE PICTURE OF SO-CALLED EMBOLISM. WITH THE PATHOLOGICAL EXAMINATION.[1]

By Dr. LEONORE WELT, Geneva.

Slightly Abridged Translation by Dr. Ward A. Holden.

ENGLISH and French authors have long conceded that the ophthalmoscopic picture of embolism of the central artery of the retina might be caused by a thrombotic plugging of the vessel. The transitory cloudings of vision were regarded clinically as characteristic of thrombosis. Thus Parinaud[2] said: "The following observation is interesting from more than one point of view; it offers an example of typical thrombosis of the central artery of the retina, producing complete blindness only progressively and after several days, contrary to what is observed in cases of embolism, the loss of vision here being almost always sudden." And Priestley Smith[3] laid much weight upon the early diagnosis between embolism and thrombosis, since in the latter condition much may be accomplished therapeutically by improving the action of the heart.

This theory acquired a scientific basis first through the efforts of Haab and his pupils. In Kern's dissertation[4] and in several publications of his own,[5] the theory of the embolic

[1] From the University Eye Clinic at Zurich.

[2] "Thrombose de l'artère centrale de la rétine," etc., *Gaz. méd. de Paris*, 1882, No. 50.

[3] *Ophth. Review*, 1884, vol. iii.

[4] Zurich, 1892.

[5] *Correspondenzbl. f. Schweiz. Aerzte*, 1898, No. 11; *Report of 26th Meeting of German Ophth. Soc.*, Heidelberg, p. 160; article in *Norris and Oliver*, iv., p. 501.

stoppage of the artery, questioned by Mauthner and others, is carefully studied. Haab holds that, while the possibility of embolism cannot be excluded, no case yet examined microscopically is entirely free from objections. It was he who called attention to the endarteritis obliterans, and he believed that in most of these cases the lesion was a thrombotic plugging due to endarteritic changes.

Reimer[1] called attention to the difficulty of explaining the various clinical symptoms unless one conceded that the cause was an endarteritis proliferans or obliterans.

Indeed, there is something very attractive about this conception. It explains satisfactorily the cloudings that precede the definite blindness as being due to sudden diminution in the strength of the heart and momentary interruption of the blood current in the region in which the vessels have undergone an endarteritic change, and it explains why the blood circulation can be so soon restored by supposing an increased activity of the heart, and thus an overcoming of the obstacle. Furthermore, it has the anatomical foundation that in most of the cases reported there has been an endarteritis proliferans or obliterans.

Unfortunately it is mostly impossible to say whether this endarteritis is primary or secondary. An organized thrombus or embolus often can no longer be distinguished from an endarteritis. And even when the endarteritic changes extend to the branches of the central artery one cannot always be certain that it is a primary endarteritic process, for the interruption of the blood current by the thrombus or embolus can have an injurious influence upon the nutrition of the arterial walls and cause an endarteritis proliferans. The solution of these problems is difficult and often impossible.

Old cases, therefore, are to be interpreted with reserve. In order to solve many of these questions fresh material is necessary, and the lack of it is perhaps the reason that, although forty years have elapsed since Graefe discovered embolism of the central artery and eighteen cases have been examined microscopically, we still have so little definite knowledge of the nature of the affection.

[1] *Arch. f. Augenheilk.*, xxxviii., 4, p. 309.

In none of these cases was the interval between the onset of the affection and the microscopical examination of the eye less than five weeks, and in most cases it was much longer. Recently two cases have been reported in which the interval was less, and my case comes in the same category.

Is it purely chance that in the fresh cases the condition was quite different from that in the older cases? For in Diegrist's case, in which the eye was obtained six days after the onset of the affection, an embolism was reported, but no disease of the vessel wall; in my case, examined three weeks after the sudden failure of vision, there were slight endarteritic changes and thrombosis; and in the oldest of the cases in this category, that of Michel, after five weeks a thrombus, dependent upon endarteritic changes, was found.

Before describing these cases it may be mentioned that there were earlier microscopical examinations of eyes in which the diagnosis of thrombosis was made, or the diagnosis was uncertain as to thrombosis or embolism. One report was by Schmidt-Rimpler,[1] another by Nettleship,[2] and a third by Ridley.[3] But since these cases were respectively ten, four, and three months old, and in part complicated with inflammatory processes, I shall not describe them here.

In Siegrist's[4] case the patient was to be operated on for carcinoma of the tongue, before which the external carotid was ligated. A week after the operation there was severe hemorrhage, and to prevent recurrence of the hemorrhage the common and internal carotids were ligated.

On the day these vessels were tied the patient noticed that he could no longer see with the eye on that side, and ophthalmoscopically the picture of embolism of the central artery was found. On the sixth day after the ligature was applied the patient died, with symptoms of dyspnœa and cyanosis.

At the autopsy a thrombus was found in the internal carotid, ascending from the point of ligation up through its

[1] *Archiv. f. Ophth.*, xx., p. 287.
[2] Cited in *Centralbl. für Augenheilk.*, 3, p. 386.
[3] *Ophth. Hosp. Review*, xiv., p. 264, 1893.
[4] "Die Gefahren der Ligatur der Carotis communis und interna für das menschliche Sehorgan," *27th Report of Heidelberg Ophth. Soc.*, 1898.

branches. It extended 6 *mm* into the ophthalmic artery and ended in a conical point. Three fourths of a centimetre farther on a plug was found which extended from the ophthalmic artery into the central artery, ending before the latter entered the optic nerve.

Siegrist considered this plug an embolus, on which thrombotic masses had been deposited both centrally and peripherally. The embolus was supposed to be a bit broken away from the thrombus in the internal carotid.

None of the reasons advanced by Siegrist really proves that this was, indeed, an embolism, as Michel [1] has shown. It is much more probable that in the ophthalmic artery, the internal carotid, the arteria fossæ Silvii, the arteria corporis callosi, and communicans posterior, as well as in the central artery of the retina, there was thrombosis, probably of a marantic nature.

In Michel's case, an apparently healthy man of fifty-eight suddenly became blind in the right eye. Ophthalmoscopically there was found the picture characteristic of embolism. The acuteness of vision increased in a month from the ability to count fingers near by to the ability to count them at 4–5 *m.*

The general examination revealed enlargement of the left ventricle and extensive atheroma of the arteries of the body, which was verified at the autopsy, six weeks later, when there was found also a chronic interstitial nephritis. The diagnosis of the eye condition, which was thought to be an anterio-sclerotic or thrombotic blocking of the central artery, was also confirmed when the nerve and eyeball were examined, there being found an endarteritic affection of the central artery most marked just behind the lamina cribrosa. Beyond this narrow place there was a slightly shrunken thrombus of a dirty-brown color, with pigment scattered regularly through it. It was, therefore, a case of thrombosis dependent upon endarteritis proliferans. Michel's other cases of thrombosis will not be alluded to here, since they did not present the clinical picture of embolism.

My case now follows, the clinical history having been

[1] *Zeitschr. f. Augenheilk.*, ii., p. 9.

given to me through the kindness of Professor Eichhorst, director of the clinic for internal medicine, under whose care the patient was.

A pregnant woman, of thirty-four, presented in the middle of September, 1898, the symptoms of nephritis and ulcer of the stomach. In the night of October 30th her condition suddenly became worse. With severe headache and pain in the stomach the patient vomited a quantity of blood, and partially lost consciousness. Immediately afterwards she noticed that she could not recognize the features of persons about her. On November 19th she was brought to the hospital, where she died two days later, with symptoms of nephritis after she had aborted and a fibrinous pericarditis and pneumonic foci had appeared.

Professor Haab examined the eyes on November 4 and found the following condition. The pupils are of medium width and respond well. R v = fingers at 1 *m*, L v = fingers at 1.5 *m*. In both eyes the margins of the disc were blurred and about the disc and macula the retina over a large area was grayish white, the fovea appearing as a red spot—the usual picture of embolism. In the cloudy portion of the retina were some round white spots and some elongated, radiating small hemorrhages, such as are found in cases of albuminuria. In the left eye there was an extensive detachment of the retina upward and outward, and also a peripheric detachment in the right eye. The retinal arteries appear interrupted at places by white stripes.

Digitalis was given and vision improved to R $\frac{1}{6}$, L $\frac{1}{24}$.

November 9th a second examination revealed a similar condition. The detachment, however, had disappeared in both eyes. The retinal arteries were very small, the veins slightly dilated.

The condition indicated partial stopping of the central artery, with albuminuric retinitis and its results. Tension normal.

No further examination of the eyes was made.

From the autopsy report through the kindness of Professor Ribbert I take the following extracts.

Cranial Cavity.—On the inner surface of the dura are extensive, delicate membranes easily detachable. The vessels of the base have thin walls, are fairly wide, and are filled with blood.

Thorax.—In the left pleural cavity and within the pericardium is a cloudy liquid with floccules of fibrin. The left side of the heart is enlarged, the mitral valve thickened. In the lower lobes

of the lungs are numerous reddish-gray foci as large as a bean, and fibrin is deposited on the surface.

Abdomen.—The capsule of the left kidney is readily detached. The surface is smooth. On the posterior surface are numerous punctate ecchymoses and yellowish points, and besides these a cyst. The cortex is cloudy. In the lower part is an encapsulated tumor composed of yellow, partly hemorrhagic, tissue. The right kidney like the left, except that there is no tumor in it.

The mucosa of the stomach is pale and exhibits defects. One defect as large as a five-franc piece, sharply outlined and involving only the mucosa, lies near the pylorus.

Pathological Diagnosis: hemorrhagic pachymeningitis, serous pericarditis, interstitial myocarditis, pneumonia, interstitial nephritis.

Since the microscopic condition of the two optic nerves differed, they will be described separately.

The right eye was fixed in Flemming's solution and imbedded in paraffine. The adherent portion of the nerve, 1.5 *cm* long, was cut in continuous serial transverse sections, and the posterior portion of the ball was cut in equatorial sections. The sections were stained with safranin, hematoxylin-eosin, and orcein.

In the optic nerve the central artery could be followed up to its emergence from the ophthalmic artery, and the latter artery also could be followed a short distance. Both were of normal appearance and were filled with well-preserved blood corpuscles. The walls were not thickened. The elastica was regularly plaited. The intima was not thickened, and the only changes noticed in the endothelium were of post-mortem character.

From the point of entrance into the nerve the artery contained a network of fine threads passing from the vessel wall and containing in its meshes a finely granular mass. No red blood corpuscles but many white ones were present. This network extended to the division of the artery in the disc and also a short distance in one of the branches.

The walls of the arteries exhibited slight but unmistakable thickenings of the intima. The endothelium was swollen and masses of it projected with irregular contours into the lumen of the vessel.

Professor Ribbert, who was kind enough to examine these preparations, stated that this was a blood-corpuscle thrombus of the central artery and its branches, only a few days old, and probably of marantic nature.

The central vein exhibited no changes.

Although the Weigert stain could not be used for staining the medullary substance in the nerve after hardening in Flemming's solution, it was evident that the nervous tissue was atrophic at many points and the glia cells increased in number.

The intima of the smaller vessels exhibited numerous points of fatty degeneration.

The pigment layer of the retina remained with the choroid and was separated from the retina by a mass rich in fibrin and containing a few leucocytes.

Near the disc and about the macula were hyaline globules in the outer nuclear layer, and also phagocytes, filled with fat globules, indicating the previous existence of hemorrhages.

Recent small hemorrhages were found at numerous points in all the layers of the retina.

Some of the retinal vessels were thrombosed. The nerve-fibre and ganglion-cell layers were not particularly altered.

The vascular system of the choroid was overfilled with blood and there were numerous hemorrhages.

The ciliary vessels were normal.

The left eye was hardened in formol and imbedded in celloidin. The sections cut as in the other eye were stained with hematoxylin-eosin, orcein, and by van Gieson's method.

The pial sheath was thickened.

The ophthalmic artery and its branches exhibited changes dependent upon post-mortem lesions in removing the eye, but of importance because of the readiness with which they might be misinterpreted. In the middle of the vessel was a mass composed of blood corpuscles pressed together. This mass was pervaded with spindle cells and partially surrounded by them. The cells were seen to be connected with the endothelium of the vessel wall. Between this mass and the vessel wall a free space was left in which lay well-preserved blood corpuscles. The entire formation resembled an

organizing thrombus or embolus and was so regarded by others and by myself until Professor Ribbert, who kindly examined the preparations, denied this positively and explained the formation as a post-mortem one which is little known and arises mechanically from the pressure and traction which are exerted in removing the specimen, the endothelium of the vessel being stripped off and mixed with the blood. Professor Ribbert showed us sections from the kidney in which the same formations appeared in the vessels when there could be no question of thrombosis. It is of great importance that this appearance should be known, since it closely resembles a thrombus and may easily lead to error. Care should be taken in removing the eyeball and optic nerve together that injury be not done.

The central artery was filled with well-preserved blood corpuscles and apart from slight thickenings of the intima exhibited no changes and there were no signs of stoppage in its course through the nerve.

The condition of the central vein, however, was unusual. It was poorly developed and it left the nerve far forward, half-way between the disc and the point of entrance of the central artery. It ran then in the subarachnoidal space and at a level with the point of entrance of the central artery united with a large branch which ran through the entire region of the nerve not provided for by the central vein.

From its dividing point in the disc back to its emergence from the nerve trunk the vein was thrombosed. Near the disc the thrombus consisted of a thick network of fibrin filaments, which evidently originated from the endothelium, and some red and white corpuscles. Farther back there was besides the threads a very finely granular mass, and near the exit of the vein from the nerve trunk the vein contained a great number of well-preserved blood corpuscles, which, near one wall, were pervaded with the fibrin filaments. This, as Professor Ribbert assured us, was a very fresh blood-corpuscle thrombus.

Parallel to this thrombosed vein ran another which was full of blood and doubtless in part had assumed the function of the central vein.

All the branches of the central vein had a free lumen and otherwise exhibited no changes.

At the disc there was a large subhyaloid hemorrhage and smaller hemorrhages in the tissues.

The retina, as in the other eye, was separated from the pigment epithelium by a fibrinous mass, and in its outer layers particularly were many hyaline globules.

The most marked retinal changes were in the nerve-fibre and ganglion-cell layers. They were thinned and exhibited many empty cavities. Many of the ganglion cells were swollen, others were shrunken, and others were in a state of degeneration. These altered ganglion cells were found in greatest number near veins that were thrombosed.

In the retinal vessels slight thickening of the intima was found and many of the veins contained blood-corpuscle thrombi. The arteries seemed not to be thrombosed.

In the choroid there were thrombi and hemorrhages. The ciliary vessels were normal.

The results of the microscopic examination may be stated in short as follows:

In both eyes there were the changes found in albuminuric retinitis: a transudation between the pigment epithelium and the layer of rods and cones; deposits of hyaline masses in the outer layers of the retina, apparently with phagocytes about them; hemorrhages in various layers of the retina. Besides these there were the changes known to follow blocking of the central artery: degeneration of the nerve-fibre and ganglion-cell layers, and ascending atrophy of the optic nerve. There were numerous thrombotic pluggings of the larger and smaller retinal vessels. In both eyes there were choroidal changes.

In the right eye there was a fresh blood-corpuscle thrombus of the central artery and its branches. In the left a fresh blood-corpuscle thrombus of the central vein.

How do the pathological changes found accord with the clinical symptoms?

A gravid patient with nephritis is attacked with severe general symptoms and excessive hemorrhage from the stomach and suddenly notices a marked diminution of

vision. Four days later an ophthalmoscopic examination reveals the picture of so-called embolism of the central artery besides an albuminuric retinitis, with R v = $\frac{8}{200}$, L v = $\frac{6}{200}$. After the use of digitalis the vision improved rapidly to R v = $\frac{1}{60}$, L v = $\frac{1}{24}$, and on the tenth day a partial restoration of the circulation was observed with the ophthalmoscope.

It is clear that the sudden diminution of vision and the picture of embolism three weeks before the patient's death was not due to the thrombus found in the central artery of the right eye, nor to the thrombus found in the central vein of the left, since these thrombi were of more recent date.

I would explain the first diminution of vision as being due to thrombosis of the central artery in each eye due to the altered state of the blood from the nephritis and to the diminution of vascular tension from the sudden excessive loss of blood. The partial restoration of circulation and vision I would explain as being due to the overcoming of the thrombus when the general arterial tension was increased again.

The thrombus found after death in the central artery of the right eye was due to a fresh process caused by the weakened heart of the reduced patient.

In the left eye the circulatory conditions were more favorable—the vision being better—and the heart was sufficiently strong to drive the blood through these arteries, but in the poorly developed and abnormally running central vein the circulatory conditions were bad and a thrombus formed. The characteristic changes following thrombus of the vein were not observed here, probably because the thrombus formed very late and because the blood was carried off in part by an accessory vein.

Further observations will show in how far these hypothetical explanations are justifiable.

From this investigation it is clear that *the ophthalmoscopic picture of so-called embolism of the central artery of the retina may be produced by thrombosis of the artery.*

And thrombosis may take place

1. *From endarteritic changes, as in v. Michel's case.*

2. *As a symptom of thrombosis of an entire arterial tract, as in Siegrist's case.*

3. *Independently of endarteritic changes, when the blood pressure is reduced and there is a tendency to coagulation of the blood and fatty degeneration of the intima, as in my case.*

To Professor Haab my thanks are due for the material used and for his assistance in carrying out the investigation.

ON EMBOLISM OF THE CENTRAL ARTERY OF THE RETINA.

By Professor C. SCHWEIGGER, Berlin.

Translated by Dr. Ward A. Holden.

ONE of the most brilliant examples of Graefe's acuteness and accuracy of observation was his diagnosis of a case of embolism of the central artery of the retina.[1] This discovery naturally was received with enthusiasm on all sides, but too much was made of the name. Graefe's accurate description was not sufficiently regarded. It soon became the custom to call every sudden blindness with cloudiness of the disc and retina near the posterior pole embolism, although the blood continued to circulate in the arteries. A diminution of the blood current can, of course, cause marked disturbances, but embolic stopping of a retinal artery necessarily is followed by a complete emptying of the artery beyond the obstruction. Yet no importance is laid upon the emptiness of the arteries, which Graefe considered most important, and the cloudiness of disc and retina with the red spot at the macula are considered sufficient grounds for the diagnosis. This condition of the fundus with sudden blindness was known long before Graefe described his case of embolism and was designated infiltration of the retina; instead of infiltration one now said embolism, that was all.

Even the red spot in the fovea centralis was rightly interpreted as a phenomenon of contrast. Since the fovea contains no tissue capable of becoming opaque, the dark red of

[1] *Graefe's Archiv*, v., 1, p. 16.

the choroid shows through, sharply differentiated from the cloudy gray of the retina surrounding it.

Infiltration of the retina is now a forgotten term, yet Graefe in the paper cited above spoke of it as a well-known ophthalmoscopic condition. And Mooren [1] reported more than seventy-six cases designated as infiltration of the retina, without, however, sufficiently distinguishing between neuro-retinitis and similar conditions.

But Graefe's case was quite different from those which before had been called infiltration and afterward embolism.

The patient was first seen a week after his sudden loss of sight; there was no perception of light and the fundus presented a picture which Graefe "had never seen before in a case of recent blindness," and, furthermore, probably never saw again. "The media were clear, the disc pale, and all the papillary vessels reduced to a minimum size. The main arterial branches beyond the disc appeared as narrow lines and their finer branches were correspondingly narrowed. Twigs which under normal conditions would have been clearly visible had disappeared completely. The condition of the veins was different. They were indeed everywhere narrower than normal but their fulness increased toward the equator of the ball." The decreasing fulness of the veins toward the disc was sufficiently explained by the absence of blood pressure and by the great elasticity of the walls of the larger vessels, by which the venous trunks near the disc were markedly narrowed.

Worthy of note, furthermore, is the absence of any cloudiness of disc or retina. The substance of the disc was transparent from its surface to the lamina cribrosa, and the region of the macula did not become abnormal until two weeks after the onset of the blindness. The central portion of the retina began to throw a cloudy veil over the underlying choroid and about three weeks after the embolism a completely opaque, grayish-white infiltration was present.

The well-known red spot now appeared at the fovea centralis. The cloudiness of the retina extended, gradually diminishing, nearly to the disc. In the neighborhood of the

[1] *Ophth. Beobachtungen*, 1867.

disc to the temporal side the retina was slightly affected, to the nasal side it was entirely normal. There was no cloudiness of the optic nerve; finally the nerve became atrophic.

The appearance in Graefe's case thus differed materially from that later designated as embolism and previously as infiltration of the retina. The chief characteristic was the complete emptiness of the arteries in their entire course and the narrowness of the veins. The optic disc was not cloudy and the cloudiness of the retina at the posterior pole first developed two weeks after the embolism.

It cannot be doubted that an embolus may find its way into the central artery of the retina, but this must be a rare occurrence, and the great number of cases observed under this designation, itself proves that, as a rule, the condition must be other than embolism. Graefe's case was in fact one of the few cases, or perhaps the only one, in which there was actually an embolic plugging of the central artery, which after the death of the patient was confirmed by me at the anatomical examination.[1] The retinal artery in the region of the lamina cribrosa was found to be completely blocked by a spherical coagulum. I have already refuted the suggestion of doubt advanced in regard to this case.[2]

Doubt as to the correctness of the ordinary diagnosis of embolism was expressed by me more than thirty years ago; but only in recent years has an anatomical basis been given for these cases of sudden blindness by the demonstration of the endarteritis with narrowing of the lumen which accompanies various forms of retinal disease. The view that sudden blindness with cloudiness of the disc and retina depends upon embolism arose only because the appearance that was previously termed infiltration, later was termed embolism. But Graefe's case teaches that an embolism of the central artery of the retina is not followed immediately by cloudiness of the disc and retina. On the contrary, the narrowing of the retinal arteries from endarteritis must needs cause a slowing of the blood current, which may well be the cause of this infiltration.

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[1] *Vorlesungen über den Gebrauch des Augenspiegels*, 1864.
[2] These ARCHIVES, German Edition, xi., p. 444.

But this peculiar sort of cloudiness of the retina may develop also without disturbances of circulation, as I observed in an earlier case (*Klin. Monatsbl. f. Augenheilk.*, xii., p. 25). The patient, aged twenty-one, was shot on Sept. 10, 1870, and the left eye at once became blind. The patient was seen a half-hour later. The wound of entrance of the shot was found in the lower lid near the outer commissure. Slight exophthalmus. Mobility of the eye somewhat limited in all directions. Cornea, iris, etc., entirely normal. On closure of the right eye the pupil of the left at once became wider and unresponsive, but reacted consensually with the other; no perception of light. Refractive media clear; optic disc, vessels, etc., normal. In the macula a slight gray opacity through which the fovea shows red. In the course of the following days the cloudiness of the retina gradually increased. It became denser and larger until it reached the optic disc and the equator of the ball. The retinal vessels were covered here and there by the opacity, but that there was no interruption of circulation was shown by the fact that gentle pressure on the eye produced arterial pulsation. In about four weeks the opacity of the retina had passed off and an atrophic degeneration of the optic nerve had developed. In all probability the blindness was caused by the shot striking the optic nerve in the optic canal. It is worthy of note, however, that similar cases of blindness from interference with conduction in the optic nerve in the optic canal, as they are found particularly after fractures of the base, are not accompanied with cloudiness of the retina.

This is an isolated and a very unusual case, but it proves that this peculiar cloudiness of the retina does not always arise schematically in a particular way, but that here, also, different causes may lead to the same effect.

ON BELL'S PHENOMENON.

By Prof. WILIBALD A. NAGEL, Freiburg-in-Br.

Translated by Dr. Ward A. Holden.

BELL'S phenomenon consists in the fact discovered by Charles Bell, in 1823, that when normally the lids are actively closed there occurs an associated movement of the ball, the cornea turning first up and in and then up and out, where it remains while the lids are held closed. The phenomenon is most evident in cases of unilateral facial paralysis, since if the effort is made to close both eyes the palpebral aperture remains open on the paralyzed side, while the cornea is turned upward in the manner described.

Bell recognized the phenomenon as a purely physical one, which is more manifest in cases of facial paralysis, but others have regarded it as pathological, or even as pathognomonic of certain forms of facial paralysis. This error has been corrected by Köster, and lately by v. Michel, and to-day it is uniformly believed that this is a normal physiological process.

There is, however, some doubt as to the way in which the phenomenon is brought about—in other words, as to the connection between the closure of the lids and the upward movement of the ball.

Mendel[1] and Negro[2] believe that there is a connection between the nuclei of the oculomotor and the facial nerve of such sort that excitation of one nucleus may be transmitted to the other nucleus and the other nerve, and that under certain conditions this must occur. v. Michel[3] main-

[1] *Neurolog. Centralbl.*, iv., 1897.
[2] *Bolletino del Policlin. gener. di Torino*, 1898.
[3] *Beiträge z. Phys., Festschrift*, 1899, p. 159.

tains, on the other hand, that there is no anatomical basis for such a connection, and he is more inclined to assume a functional connection between the corresponding cortical regions.

Without going deeper into the discussion of this question, I would call attention to the fact that seems to be of importance, viz., that under certain conditions the mechanical excitation of the sensory nerves of the cornea by the pressure of the upper lid may reflexly cause the upward movement of the eyeball.

I do not maintain that Bell's phenomenon is to be considered exclusively a reflex, and that the idea of a simultaneous innervation of the orbicularis and of the elevators of the ball must be given up. In favor of the latter idea is the continuation of the phenomenon when the closure of the lids is prevented. At first glance this association seems incomprehensible, and the upward movement of the cornea merely a purposeless associated movement; but the upward movement may be regarded as the expression of a tendency to bring the eyeball into such a position behind the closed lids that their pressure upon it is reduced to a minimum. It is at once evident that the cornea would be less pressed upon when it lay beneath the soft upper portion of the lid than when it lay directly behind the hard tarsus.

The disposition to turn the cornea upward when the lids are closed is not very intense, for it is well known that it is easy to hold the eyes in the primary position, even when the lids are closed, and, furthermore, no feeling of pressure upon the cornea is then experienced. It can readily be shown that the eye can be held in the primary position, by obtaining an intense after-image of a flame and then closing the eyes gently, when the after-image may be held to the point where the flame actually exists.

It has been stated by various observers that Bell's phenomenon does not take place when the lids are closed gently as in normal sleep, but the phenomenon is well marked when the lids are pinched tightly together, or pressure is exerted on them. Even the touching of the closed lids with the finger increased the tendency of the ball to turn upward. The

forcible prevention of the closure of the lids through pressure with the fingers or the lid elevator increases the tendency, as is generally known, but it is perhaps not generally known that pressure on the lids, or even the presence of an occlusive bandage, affects the position of the eyes.

In some experiments on adaptation of the eye I kept one eye bandaged and read or wrote with the other. But I soon noticed a feeling of discomfort. My neck grew stiff and I found that this was due to the peculiar position of the head which I had involuntarily assumed. My chin was bent down and I was looking at the book or paper with the eyes turned considerably upward. This position, which soon caused fatigue of the muscles of the neck and eyes, was given up at once when the bandage was so arranged that the darkened eye was kept open.

The relation of this observation to Bell's phenomenon would seem to me to be as follows: The closed eye, in order to relieve itself of the pressure of the lid and the bandage, tended to roll upward, but this was not possible while the open eye was fixed on an object beneath it. Then unconsciously the head was turned downward so that the open eye could still fix the object while the visual lines of the two eyes were directed upward. The tendency to change the position of the head was strongest when the occlusive bandage was loose and the closure of the lids incomplete and thus the pressure relations of the cornea particularly unfavorable. The effort to remain with the gaze directed downward under the circumstances is very trying and one feels an evident relief when the gaze is directed upward. Under a firm bandage the annoyance is less and the tendency to turn the head downward is less pronounced. If the cornea of the closed eye is cocainized the annoyance at once ceases and the gaze can be directed downward without fatigue. On the other hand I found the disagreeable effect of the pressure upon the cornea very much increased while I was suffering from an abrasion of the epithelium.

The tendency of the cornea to turn upward even in passive closure of the lids has been sufficiently proved, and this is a further support of the opinion expressed that Bell's

phenomenon is in reality a reflex change in position of the eyeball.

The question arises whether this idea is in accord with all the facts observed, and whether we must not also concede a simultaneous innervation of the orbicularis and the elevators of the eye dependent upon cortical associations, as has been assumed by the authors mentioned above.

Sufficient facts have not yet been collected to allow a definite conclusion. This would be possible if it were found that in a case of paralysis of both orbicularis muscles the corneas still retained their tendency to turn upward when an effort was made to close the lids. With paralysis of one orbicularis only, we may suppose that the closure of the lids accomplished in one eye gives rise to Bell's phenomenon in both. However, the marked upward deviation of the cornea with forcible opening of spastically closed lids appears to indicate that a much more intense innervation impulse is exerted than in closure of the lids when there is no resistance. It may not be going too far to suppose that the Bell movement in ordinary closure of the lids is a reflex act dependent upon the closure, but in spasmodic intentional closure of the lids the excitation may reach some higher point of the central nervous system, perhaps, according to v. Michel's assumption, in the cortex, the centres of the nerves of the ocular muscles, and particularly the elevators. The frequency of the reflex may have led up to such an extension of the excitation.

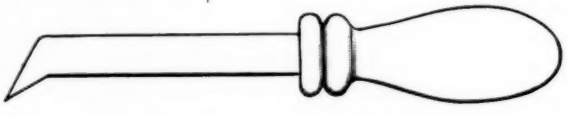
The assumption of a reflex process to explain Bell's phenomenon apparently makes the matter seem more complicated, but in reality the entire matter becomes more comprehensible.

THE USE OF A GLASS LACHRYMAL PIPETTE.

By Dr. W. H. BATES, New York.

(*With one figure in the text.*)

DURING the past nine years I have had much satisfaction from the use of my glass pipette. Others who have seen it are pleased with it and prefer the pipette to the Anel syringe for the injection of fluids into the lachrymal sac through the punctum of the lower lid. A paper which first described it was published in the *Medical News*, January 20, 1894. At first I made my own pipettes, by heating the tip of an ordinary eye-dropper in the flame of an alcohol lamp, and when at a red heat drawing out the tip quickly with forceps to a fine point. I was not always successful in obtaining a good tip and for a number of years sought unsuccessfully a glass-blower who could make the pipettes satisfactorily. Recently B. W. McFarland, 278 Canner St., New Haven, Conn., has made them for me and improved the shape of the tip so that the glass point is less easily broken when accidentally struck by a metal instrument or dropped on a hard floor or table.



One may hesitate to use this pipette because it has a glass point and because of the fear of breakage while the tip is inserted in the punctum. This fear is groundless. It is impossible, by the use of ordinary force or by the movements of

the eyelids while using this pipette for syringing into the punctum, to break the point. The tissues of the lids are so movable that one can with the glass tip push the lower lid strongly without breakage of the glass point. The conjunctiva has never been wounded by me with the glass pipette. I have made more than 40,000 injections through the punctum without injury to the patient's eye.

The pipette resembles the ordinary glass eye-dropper but has the tip drawn out to a fine point and bent at an angle of about 45°. The bent portion is one fourth of an inch long. The opening in the tip is small enough to enter the smallest punctum, yet tapers so abruptly from the point that it is soon large enough to close the largest-sized punctum, and for this reason a return flow of fluid is prevented. To fill the syringe with air requires half a second after removal of the pressure of the fingers on the bulb. To fill the barrel one inch with water requires less than five seconds. A point so fine that thirty seconds or more are needed to fill it with fluid is not necessary for practical use. The pipette with its rubber bulb is about three inches long. It weighs about sixty grains, which is one half the weight of the average lead-pencil. Although it is light and small the pipette has sufficient power for syringing the lachrymal sac. With it a stream of water can be thrown ten feet.

The advantages of a glass pipette over the Anel metal lachrymal syringe are many. Besides being lighter and cheaper, it is less liable to become injured by the use of various solutions. When soiled, it is more easily cleansed than one of metal. A metal point soon becomes clogged, while a glass one does not. The Anel syringe is cumbersome and is manipulated with difficulty, while one can make the injection with the pipette much more easily. As glass is not injured by acids, chemicals, or boiling water, the pipette can be better cleansed and sterilized. Any solution may be used, which is not the case with one of metal, as the fine metal point is affected by some astringent and antiseptic solutions. With the glass pipette one can usually see when it becomes soiled, while with a tube of metal one can never be certain that it is perfectly clean.

A metal syringe, besides being more difficult to manipulate, has the additional disadvantage over the glass pipette, in that one is usually uncertain when the injection is being accomplished. With the glass pipette, the column of fluid is seen to descend as it enters the punctum. I had made a lachrymal syringe with a metal tip and point and a glass barrel, but discarded it in favor of the glass pipette.

To make the injection, the operator sits in front of the patient, or he may stand behind the patient, who is seated or lying down. Artificial light is reflected by a forehead mirror to the inner side of the eye. This gives a better illumination than sunlight. The patient is directed to look upwards and outwards. The left thumb of the operator everts the lower lid just enough to expose the punctum. The pipette, partly filled with fluid, is lightly held by the bulb with the thumb and first two fingers of the right hand, just as one would grasp a pen to write; the tip is inserted into the punctum and the pipette turned until the tip is at a right angle to the margin of the lid and parallel to its conjunctival surface. One may need to vary this angle in some cases to accomplish the injection. Slight pressure is made on the bulb, and the level of the fluid is seen to descend as the injection is being made. I usually hold a wad of cotton with the thumb of the left hand pressed against the lower lid, to receive and absorb the excess of fluid. When no overflow of fluid is expected, the cotton is superfluous.

Sometimes the fluid returns from the sac through the upper punctum. To prevent this, the upper punctum can be closed by light pressure of a piece of cotton wad one quarter of an inch in diameter, held over the opening with the tip of the forefinger of the left hand. This procedure is indicated in patients with stricture of the nasal duct, and in some normal cases when the puncta are unusually large. The injection can be made through the punctum of the upper lid, but the manipulations to accomplish it are more complicated.

Among the difficulties noted are that the punctum may be so small that the tip of the syringe does not readily enter, or one may have trouble in finding this opening. An ordinary pin is useful. With it the punctum can be located and

its calibre dilated. It is never necessary to enlarge the punctum with a knife. Nervous patients may give trouble, and in such cocaine helps, but does not always relieve the difficulty.

Care of the syringe is important. Although one can strike the point against the palm of the hand with considerable force without breaking the tip, yet after knocking it lightly with a hard instrument, or after dropping it on the floor or table, the point may be broken. To prevent breakage, the pipette should always be kept in a box by itself, well embedded in soft cloth. Cotton should not be used, as it sometimes finds its way into the tip and clogs the opening. After using the pipette it should always be returned to its case. Never allow the fluid to reach into the rubber bulb, as particles of dirt from the rubber may occlude the tip.

Cleansing the syringe after use should be made a rule. It is best to wash it out first with water and then with alcohol. Unless this is done at once, the evaporation of the fluid leaves a residuum which in time fills the opening. Should the tip become occluded, it may be cleared as follows: Remove the rubber bulb, fill the tube partly with water, replace the rubber bulb, and hold the tip over the flame of the lamp, not too close. As the glass becomes heated it expands, and pressure on the bulb will usually drive out the water with the dirt, and the point is freed. Should this procedure fail, it may be necessary to place the glass part of the pipette in nitro-muriatic acid to clear the opening of the tip.

PERFORATING WOUND OF UPPER LID AND EYEBALL. REDUCTION OF PROLAPSED IRIS. RECOVERY.

By Dr. S. J. McLENNAN, Glau Bay, C. B., Canada.

THE following case, which appears to be of some interest, occurred in my practice.

A locomotive driver, aged thirty, met with the following accident: While examining the lubricator glass on his engine, an explosion occurred, and he was struck on the right eye by one of the flying fragments of glass. He sustained the following injuries: The upper eyelid received a lacerated wound almost throughout its entire extent, commencing at a point close to the lower canthus. There was also a wound of the eyeball, beginning just above the margin of the pupil, and extending through the cornea, ciliary body, and for a considerable distance into the sclera. There was a slight protrusion of the iris. Effusion of blood into the anterior chamber and an escape of a considerable amount of vitreous.

The wounds were carefully cleansed and douched with a bichloride lotion 1 in 10,000. The eyelid was sutured with horsehair. The iris was gently replaced, but the wound of the eyeball showed a decided tendency to gape, and with every movement there was a further escape of vitreous. Under cocaine anæsthesia the wound of the eyeball was secured by a section of sterilized silk. Atropine was instilled and the eye bandaged over an antiseptic dressing. The next day the dressing was removed and the eye douched with the bichloride lotion and atropine again instilled. This treatment was followed out each day until convalescence. The patient complained of no pain. The blood in anterior chamber was very speedily absorbed. On the third day following

injury the patient was able to discern my features. The suture was removed from the sclera on the fifth day.

Present condition six and one-half months after accident:

The pupil is round, while the site of the wound is marked by a slight scar faintly perceptible. The vision in the eye is $\frac{20}{15}$. There is not the slightest evidence of irritation.

I was induced to report this case by reading an article in the ARCHIVES for January, 1901, by Dr. Geo. Strawbridge, of Philadelphia, in which he discussed the old ophthalmic dictum that "ciliary injuries practically meant enucleation." The author's experience, based on cases, seemed to justify a modification of the dictum, and should exclude those cases where the wounds were clean and free from septic material. I simply offer this report as another confirmation of the author's conclusion.

PERISCOPIC LENSES.

By A. S. PERCIVAL, M.B., B.C., Camb.

Newcastle-on-Tyne.

(*With three figures in the text.*)

I AM not aware of any mathematical examination of the form to be given to a meniscus that will be suitable for a periscopic lens, with the exception of Dr. F. Ostwalt's paper in *v. Graefe's Archiv*, xlvi., 3. This was an excellent paper, but unfortunately there was a slip in the mathematical formula used, which seriously affected the result he obtained. I wrote to Dr. Ostwalt, pointing out the error, and received in return a most courteous acknowledgment of my correction.

Periscopic glasses are used to enable the patient to see more clearly when he moves his eyes from side to side; this is obviously a great advantage to him when playing tennis or indeed at all times. With the ordinary bispherical lenses, in order to see a lateral object clearly he has to move his head, keeping his eyes fixed opposite the centre of the glass. We know that the aberration of a planoconcave lens is greatest when the plane surface is exposed to the incident light, and is least when its position is reversed. It does not, however, therefore follow that a planoconcave lens should be worn with the curved surface facing the light. The aberration will give an indistinct image on the retina only if the circle of confusion there formed is greater than the sectional area of a foveal retinal cone. The radius of a foveal retinal cone is .001 *mm;* of a cone outside the macula is .003 *mm.* So what we have to determine is whether such

a lens will cause a confusion circle on the retina of a radius greater than .001 *mm.*

We will first take an extreme case, a −20D planoconcave in the position that induces the greatest aberration in direct centric pencils, and find the size of the confusion circle on the retina, when a distant object is viewed through such a lens by a myopic eye with a pupil of normal radius, say 1.6 *mm.* We first have to discover the effective semiaperture (y) of the lens under these conditions. Let A_1, A_2 (Fig. 1) represent the positions respectively of the plane and the

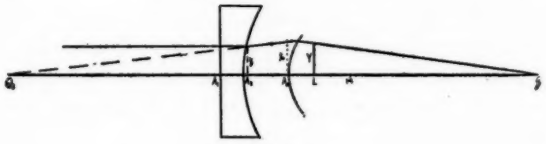


FIG. 1.

curved surfaces of the glass, and let A_0 and L represent the positions of the cornea and the pupil (Y). Now, the correcting glass must be placed in the anterior focal plane of the eye, therefore $A_2A_0 = 13.745$ *mm*, and A_0L we know is 3.6 *mm.* If the index of refraction of the glass be 1.54, the radius of curvature of the lens will be −27 *mm*, the direction of the incident light being regarded as the positive direction. Incident parallel rays, will, after traversing the lens, diverge as if from a point Q_2 (where $Q_2A_2 = 50$ *mm*), and on reaching the cornea will be refracted by it alone towards q, where $\frac{\mu^1}{q\,A_0} - \frac{1}{Q_2A_2 + A_2A_0} = \frac{\mu^1 - 1}{r_0}$

or $\frac{1.3365}{q\,A_0} - \frac{1}{63.745} = \frac{.3365}{-7.829}$ $\quad \therefore qA_0 = -48.967398$ *mm.*

Let y_0 denote the radius of the equivalent pupil in the corneal plane,

$$\text{then } y_0 = \frac{q\,A_0}{q\,A_0 + A_0\,L}\,Y = 1.72696 \text{ mm},$$

$$\text{and } y = \frac{Q_2\,A_2}{Q_2\,A_2 + A_2\,A_0}\,y_0 = 1.354587 \text{ mm}.$$

Now for direct vision through the centre of the lens, the aberration

$$df = \frac{1}{2} y^2 \rho \frac{\mu^2}{\mu - 1} \text{ (1)} = \frac{y^2 (1.54)^2}{2 \times -27 \times .54} = -.149234$$

Let R denote the radius of the circle of confusion due to the lens, R is one fourth of the lateral aberration (2), or

$$R = \frac{1}{4} \frac{y\, df}{f + df}$$

The size of the image on the retina of this circle of confusion is given by the familiar formula

$$\frac{r}{R} = \frac{F'}{F' - P},$$

where r is the radius of the retinal confusion-circle, and F' is the first principal focal distance of the eye. Therefore, $F' - p$ is the distance of the confusion-circle from the glass that forms it, or $-x$, *i. e.* $-(f + \frac{3}{4} df)$ (2)

Therefore,

$$r = \frac{y\, df\, F'}{-4 (f + df)(f + \frac{3}{4} df)} = .00031494.$$

As the retinal image of the circle of confusion is so much smaller than the maximum sectional area of a retinal cone, it is evident that centric vision through the lens will be as distinct as if an aplanatic lens had been used. We find that for eccentric vision such a lens has a decided advantage over a biconcave lens of the same strength, and an enormous advantage over a similar planoconcave placed in the reverse position.

We now come to the consideration of eccentric pencils.

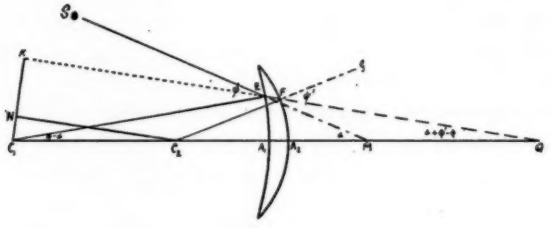


FIG. 2.

(1) *Percival's Optics*, p. 303. (2) *Ibid.*, p. 117.

GENERAL CASE FOR PARALLEL RAYS INCIDENT AT AN ANGLE α WITH THE AXIS.

In Fig. 2, C_1Q represents the axis passing through M, the centre of rotation of the globe. Parallel rays are incident on the lens in the direction SEM, making an angle C_1MS or α with the axis of the lens. In the figure C_1A_1 or $C_1E = r_1$ and C_2A_2 or $C_2F = r_2$, both measured in the positive direction. $A_1A_2 = t$, the thickness of the lens. $A_2M = k$.

To find φ and φ^1. $$\frac{\text{Sin } C_1ES}{\text{Sin } C_1ME} = \frac{\text{Sin } MEC_1}{\text{Sin } C_1ME} = \frac{C_1M}{EC_1}$$

$$\frac{\text{Sin } \varphi}{\text{Sin } \alpha} = \frac{r_1 + t + k}{r_1}$$

The expression C_1M carries the same sign as EC_1, because they are the sides of a triangle taken in order.

$$C_1EK = \varphi^1 \text{ and Sin } \varphi^1 = \frac{\text{Sin } \varphi}{\mu}$$

It will be noticed that in the figure the angles α, φ, and φ_1 are negative, being measured clockwise.

To find ψ^1 and ψ. The angle GFQ or ψ^1 is the angle of incidence at the second surface of the lens.

Now $KES = C_1ES - C_1EK = \varphi - \varphi^1 = QEM$ and $MQE = C_2ME - QEM = \alpha - (\varphi - \varphi^1)$.

From C_1 drop the perpendicular C_1K to QE produced, and draw C_2N parallel to QEK.

Then taking the projections of C_1E, C_2F, and C_1C_2 on C_1K we see that $NK = KC_1 - NC$,

or $C_2F \text{ Sin } C_2FK = C_1E \text{ Sin } C_1EK - C_1C_2 \text{ Sin } C_1C_2N$.

or $r_2 \text{ Sin } \psi^1 = r_1 \text{ Sin } \varphi^1 - (r_1 + t - r_2) \text{ Sin } (\alpha - \varphi - \varphi^1)$.

$$\therefore \text{Sin } \psi^1 = \frac{r_1 \text{ Sin } \varphi^1 (r_1 + t - r_2) \text{ Sin } (\varphi - \varphi^1 - \alpha)}{r_2}$$

$$\text{Sin } \psi = \mu \text{ Sin } \psi^1.$$

To find EF.

Again, taking the projections of EF, C_1E, and C_2F on the perpendicular to the axis C_1M, we have

$$EF \text{ Sin } MQE = C_1E \text{ Sin } AC_1E - C_2F \text{ Sin } AC_2F,$$

where $MQE = \alpha + \varphi^1 - \varphi$, $AC_1E = -(\varphi - \alpha)$, $AC_2F = -(\psi^1 - \alpha - \varphi^1 + \varphi)$

$$\therefore EF \text{ Sin } (\alpha + \varphi^1 - \varphi) = r_1 \text{ Sin } - (\varphi - \alpha) - r_2 \text{ Sin } - (\psi^1 - \alpha - \varphi^1 + \varphi)$$

$$\therefore EF = \frac{r_1 \text{ Sin } (\varphi - \alpha) - r_2 \text{ Sin } (\psi^1 - \alpha - \varphi^1 + \varphi)}{\text{Sin } (\varphi - \varphi^1 - \alpha)}$$

To find the distances V_1(1) *and* V_2(1) of the first and second focal lines due to refraction at the first surface.

Since the incident light consists of parallel rays,

$$\frac{\mu \operatorname{Cos}^2 \varphi^1}{V_1^1} = \frac{\mu}{V_2^1} = \frac{\operatorname{Sin}(\varphi - \varphi^1)}{r, \operatorname{Sin} \varphi} \qquad (1)$$

To find the distances V_1 *and* V_2 of the first and second focal lines due to the final refraction at the second surface. Remembering that ψ^1 is the angle of incidence at F_1, and that ψ is the angle of emergence at F_2, and that the index of refraction is now $\frac{1}{\mu}$, we have

$$\frac{\operatorname{Cos}^2 \psi}{\mu V_1} - \frac{\operatorname{Cos}^2 \psi^1}{U_1} = \frac{1}{\mu V_2} - \frac{1}{U_2} = \frac{\operatorname{Sin}(\psi^1 - \psi)}{r_2 \operatorname{Sin} \psi}$$

where U_1 and U_2 are the distances from the second surface of the first and second focal lines due to the first refraction.

$$\therefore U_1 = V_1^1 + EF.$$
$$U_2 = V_2^1 + EF.$$

To find r *the radius of the retinal confusion-circle.*

If y_0 denote the radius of the equivalent pupil in the corneal plane and R denote the radius of the actual circle of confusion formed by the lens with an aperture corresponding to y_0,

$$R = \frac{y_0 (V_2 - V_1)}{V_1 + V_2 - 2l} \text{ where } l = A_0 A_2 \text{ (Fig. 1)} \qquad (2)$$

$$\text{As before } \frac{r}{R} = \frac{F^1}{F^1 - p} = \frac{F^1}{-x}$$

$$\text{But } x = \frac{2 V_1 V_2 - l (V_1 + V_2)}{V_1 + V_2 - 2l} \qquad (3)$$

$$\therefore r = \frac{-R F^1 (V_1 + V_2 - 2l)}{2 V_1 V_2 - l (V_1 + V_2)} = -\frac{y_0 (V_2 - V_1) F^1}{2 V_1 V_2 - l (V_1 + V_2)}$$

I do not think that any method for finding the curvatures of the two surfaces of a periscopic lens can be devised other than the laborious one of trial. The index of refraction of the glass most of our opticians in England use for spectacles is 1.54, so I have used this value in my calculations. Dr. Ostwalt ascribed the value 1.5 to μ in his paper on the subject. I need hardly point out that results based on this

(1) Percival's *Optics*, p. 273. (2) *Ibid.*, p. 390.

value of the constant would not be applicable to glass of a higher refractive index. Most of the periscopic glasses I give allow ametropes to see distant objects as distinctly when seen at an angle of 25° with the axis, as when seen directly and centrically. As an example, let us take the case of a +8 D lens. I find if $r_1 = -30mm$, $r_2 = -54$ *mm*, a satisfactory result is obtained. Let the axial thickness τ of the meniscus be 2 *mm*. The centre (M) of rotation of the eye is usually situated 13.4 *mm* behind the cornea, which is itself 13.745 *mm* behind the anterior focal plane of the eye. Therefore A_2M or $k = 29.145$ *mm*. The values of the constants I have used in all cases have been

$\mu = 1.54$ $\quad k = 29.145$

$\tau = 2$ $\quad l = -13.745$

$\alpha = -25°$ $\quad F' = 15.498308$

Then if $r_1 = -30$ *mm* and $r_2 = -54$ *mm*

$$\text{Sin } \varphi = \frac{r_1 + k + \tau}{r_1} \text{Sin } \alpha \qquad \therefore \varphi = -41' \; 24''.44532$$

$$\text{Sin } \varphi' = \frac{\text{Sin } \varphi}{\mu} \qquad \therefore \varphi' = -26' \; 53''.28374$$

$$\text{Sin } \psi' = \frac{r_1 \text{ Sin } \varphi' + (r_1 + \tau - r_2) \text{ Sin } (\varphi - \varphi' - \alpha)}{r_2}$$

$$\therefore \psi' = -11° \; 53' \; 13''.32998$$

$$\psi = -18° \; 29' \; 40''.17118$$

$$EF = \frac{r_1 \text{ Sin } (\varphi - \alpha) - r_2 \text{ Sin } (\psi' - \alpha - \varphi' + \varphi)}{\text{Sin } (\varphi - \varphi' - \alpha)} = .767248 \; mm$$

$$\frac{\mu \text{ Cos}_2 \varphi'}{V_1} = \frac{1}{V_2} = \frac{\text{Sin } (\varphi - \varphi')}{r_1 \text{ Sin } \varphi'}$$

$\therefore V_1 = -85.5460$ and $V_2 = -85.5516$.

$\therefore U_1 = V_1 + EF = -84.778752$, and $U_2 = V_2 + EF = -84.784452$.

$$\frac{\text{Cos}^2 \psi}{\mu V_1} - \frac{\text{Cos}^2 \psi'}{U_1} = \frac{1}{\mu V_2} - \frac{1}{U_2} = \frac{\text{Sin } (\psi' - \psi)}{r_2 \text{ Sin } \psi}$$

$\therefore V_2 = -127.966607$.

$V_1 = -127.697949$.

$$r = -\frac{y_0 (V_2 - V_1) F^1}{2 V_1 V_2 - 1 (V_1 + V_2)} = -.0002655 \; mm.$$

As this is smaller than .001 *mm*, the radius of a foveal cone, the size of the confusion-circle in this case, when looking 25° to either side of the axis, is quite negligible.

I subjoin tables of the radii of curvature of periscopic

lenses of different powers, assuming that the index of refraction of the glass used is 1.54. With convex glasses up to + 8 D the retinal confusion-circle is smaller than the sectional area of a foveal cone, when an object is viewed 25° to one side of the axis. With glasses of higher power than + 10 D it is impossible to get the oblique vision to be as good as direct vision. For instance, with + 12 D periscopic the radius (r) of the retinal circle of confusion on oblique vision is .00471 *mm;* whereas, with the ordinary biconvex + 12 D lens, r = .22876 *mm.* Similarly with concave glasses of higher power than − 10 D, there is a perceptible blurring of the image when the eye looks obliquely (at an angle of 25°) through the lens. For instance with − 15 D periscopic, r = .0010416; whereas with − 15 D planoconcave (with the curved surface next the eye) r = .021296. The advantage of the periscopic lens over even a planoconcave lens is obvious.

Finally, I have plotted out on squared paper the curvatures of the different lenses. The black line represents the curvature of the surface facing the incident light, the dotted line the curvature of the surface next the eye.

The scale is 300 × 1. Thus for + 8 D the black line is at the tenth division on the negative side of the origin.

$$\therefore \frac{1}{r_1} = \frac{-10}{300} \text{ or } r_1 = -30$$

The chart shows that the curves of curvature are exceedingly curious. From + 15 D to 10 D, φ and φ^1 are positive, while ψ and ψ^1 are negative. From + 8 D to − 13 D all the angles are negative. From − 13 D to − 20 D, φ and φ^1 are negative, while ψ and ψ^1 become positive. The sharp turn at about + 5 in the curvature of the second surface is due to the fact that if the curvature becomes less towards + 2 D, V_1 becomes greater than V_2.

Consideration of the periscopic effect will often determine how to correct a case of mixed astigmatism. Suppose that a patient has

This can be corrected either

by + 2.5 D ⌒ − 5 D cyl. ax. −, or − 2.5 D ⌒ + 5 D cyl. ax. |. Clearly the latter will allow of a greater lateral ranging movement of the eyes, provided that the concave surface is next to the eye. If the first correction is used, with the cylindrical surface next the eye, the vertical ranging movement is increased at the expense of the lateral ranging movement.

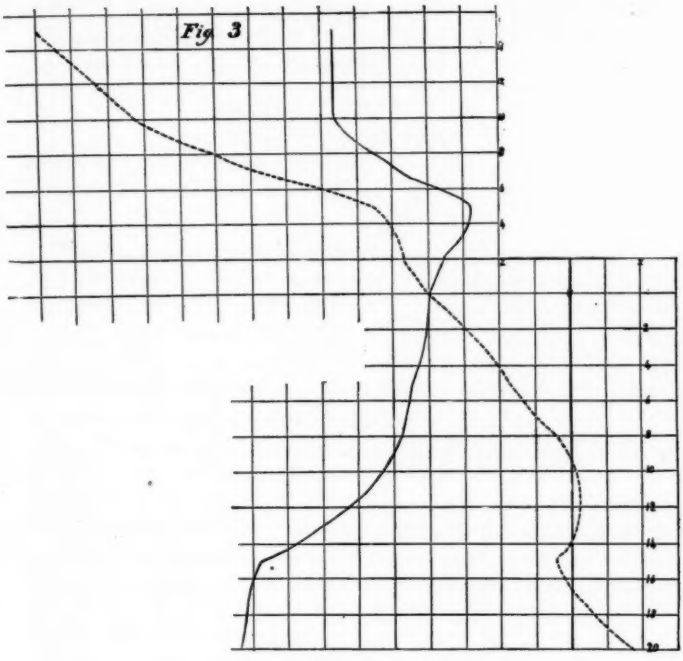


FIG. 3.

In cases of compound astigmatism it will be necessary in most cases to grind a concave spherical surface on one side, and on the other the requisite compound astigmatic surface, which has recently been done successfully by some leading opticians. This, however, adds very materially to the expense of periscopic glasses, as the process is very difficult and demands tools specially made for the purpose.

CONCAVE PERISCOPIC GLASSES

Power	r_1	r_2
− 20D	+ 172.8 *mm*	− 32 *mm*
− 17D	+ 1512 *mm*	− 32 $\frac{104}{213}$ *mm*
− 15D	− 612 *mm*	− 34 *mm*
− 13D	+ 1512 *mm*	− 42 $\frac{48}{45}$ *mm*
− 10D	+ 1512 *mm*	− 56 *mm*
− 8D	− 843.75 *mm*	− 62.5 *mm*
− 5D	− 174 $\frac{6}{31}$ *mm*	− 66 $\frac{2}{3}$ *mm*
− 2D	− 102 *mm*	− 84 *mm*

CONVEX PERISCOPIC GLASSES

Power	r_1	r_2
+ 20 D	− 17$\frac{41}{77}$ *mm*	− 50 *mm*
+ 15 D	− 20 *mm*	− 45 *mm*
+ 12 D	− 22.5 *mm*	− 45 *mm*
+ 10 D	− 24$\frac{6}{11}$ *mm*	− 45 *mm*
+ 8 D	− 30 *mm*	− 54 *mm*
+ 6.5 D	− 37.5 *mm*	− 68$\frac{2}{3}$ *mm*
+ 5 D	− 54 *mm*	− 108 *mm*
+ 2 D	− 64$\frac{8}{15}$ *mm*	− 84 *mm*

REPORT OF THE MEETINGS OF THE OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

MEETING OF MAY 2, 1901.

By Mr. C. DEVEREUX MARSHALL.

G. ANDERSON CRITCHETT, M.A., F.R.C.S.E., PRESIDENT, IN THE CHAIR.

Double pulsating exophthalmos.—Mr. Nettleship, for Dr. D. J. Wood, read notes of this case, which followed an injury to the head, and which was cured by ligature of the left common carotid. The exophthalmos developed gradually after a fall on the head; the artery was ligatured ten days after the accident. Pulsation and proptosis were permanently cured, though partial atrophy of the left optic nerve supervened.

Mr. Treacher Collins referred to a case of his own in which the injury was caused by a bullet, and which was greatly benefited by ligaturing the carotid.

Congenital ptosis.—Mr. G. W. Roll exhibited two cases in which he had performed Hess's operation with benefit. One case had been operated on three years before, and the cure was probably permanent, while the other was operated upon a year ago; but in this case it was bilateral.

The President cited five cases upon which he had operated, of which two were permanently successful, while the other three appeared to be drifting back again.

Sarcoma of the orbit.—Mr. Simeon Snell exhibited a sarcoma of the orbit, removed from a miner, aged thirty-eight, in December last. It had been noticed for eight months, and was the size of a pigeon's egg. It was definitely encapsuled, and was made up of large spindle-shaped cells.

Serous iritis and tachycardia.—Dr. Rayner D. Batten

showed two cases of this. One was a girl, aged fourteen, who had had severe serous iritis, associated with tachycardia and thyroid enlargement, which had improved at one time, and had then recurred. The second girl, aged twenty, had well-marked serous iritis, associated with tachycardia, enlarged heart, tremors, and flushings, but no distinct enlargement of the thyroid.

The PRESIDENT mentioned other similar cases.

Choroiditis.—Mr. HARTRIDGE showed a case of choroiditis which had been shown at an early stage at the December meeting. Although the changes were so extensive, yet the vision was now $\frac{6}{9}$ in one eye, and $\frac{6}{6}$ in the other.

Periscopic glasses.—Mr. A. S. PERCIVAL showed a pair of periscopic glasses, the curve of which was so made as to prevent the distortion usually experienced with ordinary glasses when looking sideways.

Malformations.—Mr. W. LANG showed an infant with a congenital notch in the outer part of the left lower lid, and a dermoid growth on the eye.

Mr. ADAMS FROST showed a child with a variety of malformations about the face. There was a quadrilateral gap in the right upper eyelid, the lashes being absent, while above the eyebrow was a tuft resembling them. The caruncle was deformed. At the outer canthus there projected a mass resembling a lobe of the lachrymal gland. The development of the external ear was defective on the same side; although there was no meatus, yet hearing was not entirely absent. A dermoid structure existed near the right angle of the mouth, which projected on to the inner aspect, and there was a dimple on the left side, as if something had been removed. The eye was healthy; there was no coloboma of the choroid.

Mr. JOHNSON TAYLOR drew attention to the depth at which the corneal dermoids are situated, and the PRESIDENT recommended the use of a blunt-pointed knife for their removal.

Refractometer.—Mr. C. BLAIR exhibited a portable refractometer, which consisted of a spectacle frame carrying revolving discs fitted with glasses so arranged that an extensive range of lenses could be placed before each eye; thus time and trouble could be saved in retinoscopy.

Foreign body in the eye.—Mr. J. B. STORY showed a thorn which had been buried in the iris for two months. When discovered it was readily removed.

The PRESIDENT said he had removed a splinter of wood from the anterior chamber which had been present for twelve years.

Primary chancre of lid.—Mr. C. WRAY showed a case of primary chancre of the lower lid, which had been inoculated by the finger nail.

Detached retina.—Mr. WRAY also showed a man who had had extensive detachment of the retina, with 15 D of myopia. The eye had been punctured twice by Wolff's operation, and hyd. cum crete gr. 2 thrice daily had been given. The retina had become reapplied, and the vision was $\frac{6}{6}$, and was still improving.

Mr. MARCUS GUNN said the operation had been done long before Wolff wrote about it, and it should not be associated with his name. There was still some detachment and choroiditis present in Mr. Wray's case. Mr. Johnson Taylor had performed the operation two or three times with bad results.

The PRESIDENT said his own experience had been disastrous. One case he had advised against operation had recently had it done abroad, and as the result the vision had fallen from J 8 to J 19.

Mr. WRAY also showed a case of doubtful exostosis of the orbit with skiagraphs.

Spring catarrh.—Mr. HOLMES SPICER showed a case of spring catarrh in a quiescent stage. The appearance was quite typical, and she had had three attacks in South Africa each summer.

Mr. LANG referred to the great importance of recognizing this condition, as he had lately seen a case which had been treated by a plastic operation under the impression that it was trachoma, and here great damage resulted.

Double temporal hemianopsia.—Mr. A. H. THOMPSON showed a case of double temporal hemianopsia which occurred suddenly in association with the vomiting of pregnancy. There was optic neuritis, and he thought that the lesion was anterior to the chiasma.

Thiersch graft of orbit.—Mr. J. H. FISHER showed a good result from the use of a large graft from the arm after removal of the contents of the orbit. He mentioned three other cases which had given good results.

MEETING OF JULY 5, 1901.

G. ANDERSON CRITCHETT, PRESIDENT, IN THE CHAIR.

Blindness resulting from sodium salicylate.—Mr. SIMEON SNELL related the following case: The patient, a girl, suffered from

articular rheumatism, for which sodium salicylate was prescribed. She woke from sleep and said that everything in front of her was dark. It was found that she was unable to tell light from dark. When Mr. Snell saw her the next day he found her totally blind, but the fundus appeared normal and showed no changes. On the following day he again saw her, when she was dying from heart disease, the result of rheumatism, and again nothing abnormal was detected in the eye. The vision never returned, and the patient died the same evening. She must have taken either 140 or 160 grains of the drug. Mr. Snell said he thought that there could be no doubt but that the drug caused the blindness. The number of recorded cases was very limited.

Sarcoma of conjunctiva.—Mr. J. B. LAWFORD read some further notes of a case of sarcoma of the conjunctiva. The patient was a woman whose conjunctiva showed marked and increasing pigmentation when she was shown to the Society in June, 1896. In the following October the eye and conjunctiva were removed and examined by Mr. Devereux Marshall, who reported the growth to be a pigmented sarcoma. There was no intraocular growth. Several recurrences were removed, and in September, 1899, the contents of the orbit were removed. The patient died on April 28, 1900, but unfortunately no autopsy was obtained, and in fact Mr. Lawford did not hear of it until some weeks later. Owing to the patient's very irregular attendance and to her refusing to have a radical operation in the early stage, her chance of cure was much reduced.

Conjunctival bridges and pouches: union of retrotarsal folds.—Major H. HERBERT, I. M. S , described a condition found in nine upper lids of seven patients of all ages. One or more retrotarsal folds had contracted permanent adhesions with the tarsal conjunctiva, evidently while displaced downwards through swelling in some previous inflammatory attack. The adhesions were sometimes multiple along the summit of one fold; in other cases smaller adhesions of underlying folds were found beneath the principal ones. The folds had retracted except where held by the adhesions, thus leaving the permanently displaced portions as broad or narrow bands or bridges of conjunctiva connecting tarsus and fornix and freely admitting the passage of a probe beneath them. There was no history of injury in any case, but in the majority there had been trachoma. Two cases were also mentioned in which small bridges of union had formed

between folds in the lower fornix. In another patient recovering from a membranous conjunctivitis the actual formation of these adhesions was seen. The union was primarily by means of fibrinous exudation, which apparently became organized. Finally another upper lid was mentioned in which a broad fold came down over the tarsus and had adhesions not only to its summit but also over the greater part of its surface, leaving only a small pouch or pocket under each curved lateral margin.

Sympathetic irido-cyclitis.—Mr. SYDNEY STEPHENSON communicated notes of a case of mild sympathetic irido-cyclitis in a child fifty-four days after removal of an injured eye. The interval of time between the original injury and the enucleation was twenty days. The injured eye was affected with puro-plastic cyclitis, but micro-organisms could not be found. The patient when seen sixteen months later had made a complete recovery.

Mr. DEVEREUX MARSHALL asked Mr. Stephenson if this were a record case. He himself had seen a mild case develop between two and three weeks after an eye had been removed for injury, but he had never seen a case develop so long as fifty-four days after enucleation.

Mr. Stephenson said that he was not certain what was the longest interval observed, but he did not think that his case was a record.

The following cases were shown: Mr. WRAY, gumma of orbit forty years after primary infection; Mr. ROCKLIFFE, cystic growth of the retina (probably carcinoma), secondary to scirrhus of the breast; Mr. MARCUS GUNN, exceptional appearance of a choroidal lesion, probably tuberculous; Mr. INGLIS TAYLOR, peculiar form of vitreous opacity; Mr. BISHOP HARMAN, hole in macula.

SYSTEMATIC REPORT ON THE PROGRESS OF OPHTHALMOLOGY IN THE FOURTH QUARTER OF THE YEAR 1900.

By Prof. ST. BERNHEIMER, at Innsbruck; Dr. O. BRECHT, Prof. R. GREEFF, Prof. C. HORSTMANN, and Dr. R. SCHWEIGGER,

in Berlin;

with the assistance of

Dr. G. Abelsdorff, Berlin; Prof. E. Berger, Paris; Dr. A. N. Alling, New Haven; Dr. Dalén, Stockholm; Dr. J. Herrnheiser, Prague; Prof. Hirschmann, Charcow; Dr. J. Jitta, Amsterdam; Dr. Krahnstöver, Rome; Mr. C. Devereux Marshall, London; Dr. P. von Mittelstädt, Metz; Prof. Da Gama Pinto, Lisbon; and others.

Translated by Dr. Ward A. Holden.

Sections I.–III. Reviewed by Prof. HORTSMANN.

I.—GENERAL OPHTHALMOLOGICAL LITERATURE.

577. **Greeff.** *Guide to the Microscopic Examination of the Eye.* 2d edition. Berlin, 1901. Hirschwald.

578. **May, C. H.** *Manual of Diseases of the Eye.* London and New York, 1900. (Reviewed in a previous number.)

579. **Swanzy.** *A Handbook of the Diseases of the Eye and their Treatment.* London. H. K. Lewis. 1900. (Reviewed in a previous number.)

580. **Oeller.** *Atlas of Rare Ophthalmoscopic Conditions.* Supplementary to the Atlas of Ophthalmoscopy. Wiesbaden, 1900. J. F. Bergmann. (Reviewed in a previous number.)

581. **Baas.** "Anatomy of Corneal Inflammation and Corneal Ulcer." *Magnus's Charts for Instruction*, xxi. Kern. Breslau, 1900.

582. **Pichler.** Course of fibres in the human chiasm. *Ibid.*

583. **Cohn.** The hygiene of the eye in the 19th century. *Berl. klin. Wochenschr.*, 1901, Nos. 4–5.

584. **Schmeichler.** The hygiene of the eye at the beginning of the 20th century. *Beitr. z. Augenheilk.*, 1900, 46.

The appearance of a second edition of GREEFF's (577) guide to the microscopic examination of the eye, first published two years ago, indicates that this elementary book is indispensable for those who are working at the microscopy of the eye.

BAAS (581) presents twelve heliotype plates representing affections of the cornea. Plate 1 shows the development of phlyctenulæ in eight figures, plate 2 scrofulous pannus, plates 3 and 4 what the author calls degenerative pannus, which is seen in iridocyclitis and glaucoma, plate 5 parenchymatous keratitis, plates 6 and 7 purulent corneal ulcer, plate 8 fresh corneal scar, plate 9 an old corneal scar, plate 10 a perforating serpent ulcer with prolapse of iris and cataract, plate 11 anterior synechiæ, and plate 12 a partial staphyloma of the cornea.

PICHLER (582) gives on twelve plates a representation of the course of the fibres in the human chiasm, as revealed by the study of partially degenerated visual tracts stained by Marchi's method. In the chiasm there is a semidecussation, but the crossed fibres greatly predominate. Just anterior to the chiasm the grouping is as follows: the uncrossed fibres from the temporal half of the retina lie in the outer half of the nerve, the crossed fibres in the inner half. The uncrossed fibres continue along the outer margin of the chiasm but lie chiefly in its dorsal portion. In the tract farther back the two groups become mingled. The crossed fibres occupy the middle of the chiasm, passing almost in a frontal direction from one side to the other, and descending from the dorsal to the ventral portion of the chiasm. The macula fibres occupy a central location in the nerves, chiasm, and tracts.

II.—GENERAL PATHOLOGY, DIAGNOSIS, AND THERAPEUTICS.

585. **Lobanoff.** On the importance of ocular infection from the air. *Graefe's Archiv*, li., 3, p. 431.

586. **Hamburger.** On the sources of the aqueous humor. *Klin. Monatsbl.*, xxxviii., p. 891.

587. **Koster.** Further experiments on filtration through fresh animal tissues. *Graefe's Archiv*, li., p. 295.

588. **Lagrange** and **Pachon.** Ocular tension and cervical sympathetic. *Soc. de Biologie de Paris.* November 24, 1900.

589. **Mayer, G.** On infection from the conjunctival sac. *Münch. med. Wochenschr.*, 1900, No. 34.

590. **Mattussowsky.** On subconjunctival injections of bichloride and salt. *Med. Beil. zum Work.* November, 1900.

591. **Demaria, H. B.** A critical study of enucleation and the operations intended to take its place and on prothesis. *Arch. d'opht.*, xx., 9, 10, 11.

LOBANOFF (585), made experiments in regard to infections of the eye from the air. The true diphtheria bacillus possesses great powers of resistance against drying and is readily carried in the dust in the air. The staphylococcus aureus also does not lose its virulence by drying unless this is long continued.

According to the investigations of HAMBURGER (586), there is a constant outflow from the anterior chamber which is not compensated for by the entrance of liquid from the posterior chamber. The necessary liquid is supplied from the anterior surface of the iris. Previous proofs that the ciliary body was the sole secreting organ really proved only that the regeneration of aqueous after its sudden evacuation was brought about by the ciliary body. The liquid so secreted differs from ordinary aqueous, however, in containing more albumen and fibrin. The best proof that the ciliary body is not to be regarded as a secreting organ is furnished by the intravenous injection of fluorescin and the equatorial section of the freshly enucleated eye. The ciliary body is then found almost free from the diffusible stain, but it appears at the surface of the iris, indicating that this is the source of the physiological aqueous humor. A direct proof of this is the fact that after the fluorescin injections the liquid can be seen to appear on the anterior surface of the iris in eyes with diminished tension. In normal conditions it would seem to be the function of the ciliary body to furnish liquid for the structures behind the iris, but the greater part of the liquid in the anterior chamber is secreted not by the ciliary body, but by the anterior surface of the iris.

According to KOSTER (587) the lymph secreted by the ciliary body can pass out from within the uvea through the optic nerve and nerve-head only. The entire uvea and the lens capsule do not permit filtration. The lymph thrown out between the choroid and sclera can pass out only along the optic nerve and the sheaths of the perforating vessels of the sclera, for the sclera itself does not permit filtration. Filtration, furthermore, cannot take place through the cornea.

LAGRANGE and PACHON (588) examined the tension of the eye of a dog whose superior cervical ganglion had been exsected. An appreciable hypotony lasted only a few months. Six weeks after the operation the hypotony was slight, and in eight weeks the tension was normal again. BERGER.

MAYER (589) found that the inoculation of the bacteria of splenic fever, chicken cholera, mouse typhus, glanders, etc., into the conjunctival sac led to a fatal general infection.

MATTUSSOWSKY (590) obtained very satisfactory results from the subconjunctival injection of 3 % salt solution in ulcerous and mycotic affections of the cornea, in various forms of iritis, and in a case of acute exacerbation of glaucoma in an eye with increased tension.

DEMARIA (591) discusses the indications for enucleation and the operations taking its place as based upon observations of the material in the Buenos Ayres clinic in the last ten years : 250 enucleations among 30,000 patients. The number of enucleations was kept down by careful treatment of severe injuries, and by the postponement of enucleation until the occurrence of very threatening symptoms. Twenty-five cases of sympathetic inflammation were observed, and in eight of these enucleation was not done, since it seemed likely to be of no value. When sympathetic inflammation comes on after enucleation the author believes that an earlier insidious beginning had been overlooked.

In panophthalmitis the disease was allowed to follow its natural course, or an incision was made. In thirty-eight cases, because of unbearable pain and bad general condition, enucleation was done under careful antisepsis with 4 % carbolic acid. The course was always normal. Of the various procedures, that of Bonnet was most generally employed, cocaine anæsthesia being used in adults.

Of the other operations incision was made seventeen times without bad results. In some cases the stump had to be removed on account of continued irritation. Amputation of the anterior segment was done twenty-three times for anterior total staphyloma. Simple evisceration was done six times in cases of panophthalmitis, but it was then given up, since the duration of treatment was longer and the cosmetic effect not good, and since others have reported that it is sometimes followed by sympathetic ophthalmia due perhaps to leaving remnants of the uvea in position.

Combined evisceration according to Mules's method and opticociliary neurotomy were not tried because of their danger. In the last portion of his paper the author criticises the procedures for improving the cosmetic effect by preventing the sinking of the upper lid and permitting more movement of the artificial eye. Only a few of these operations, such as the introduction of sponge

and the like, were tried, for the results were always nil and the foreign body was extruded. In certain cases the tattooing of a large stump to imitate a pupil and a corneal margin is a desirable procedure. MITTELSTÄDT.

III.—INSTRUMENTS AND REMEDIES.

592. **Engelmann.** Protargol in Credé's procedure. *Centralbl. f. Gynaek.*, 1901, No. 1.

593. **Polak.** The disinfection of cutting instruments with spiritus saponatus. *Inaug. Dissert.*, Amsterdam, 1900.

594. **Trombetta.** Schreiner's experiment and its practical applications. *Arch. d'opht.*, viii., 3–4.

According to ENGELMANN'S (592) experience a 20 % solution of protargol is preferable to nitrate of silver in Credé's procedure since it is much less irritating.

It is well known that instruments are dulled by the ordinary methods of disinfection. This is especially true as regards eye instruments, and therefore POLAK (593) conducted a series of experiments under the direction of Straub to ascertain in how far the spiritus saponatus recommended by Miculicz in general surgery would be of service in disinfecting instruments. He found that the spiritus saponatus killed within a quarter of an hour staphylococci in dried pus on the instruments without affecting the cutting edges. It proved to be excellent for mechanical cleansing. When rightly used it sterilized instruments in half a minute. The procedure is as follows: For a quarter of an hour before the operation the instruments are put in the spiritus saponatus, then wiped with sterile gauze and put into a 3 % boric acid solution. After the operation they are dipped into the soap again and then dried. JITTA.

TROMBETTA (594) describes an instrument he has devised which essentially is a refractive ophthalmoscope consisting of the mirror and two Recoss discs. There is also a glass, red in its right half and green in its left. The mirror can be removed and the opening covered with a disc containing two pin-holes for use in Schreiner's experiment. This last arrangement permits the instrument to be used for the measurement of the range of accommodation in emmetropic eyes and for the determination of the far and near points of myopic eyes. KRAHNSTÖVER.

Sections IV.–VII. Reviewed by PROF. ST. BERNHEIMER, Innsbruck.

IV.—ANATOMY.

595. **Damianoff.** Histological researches on the crystalline lens and the zonule of Zinn. *Thèse.* Montpellier, 1900.

596. **Berger.** Experimental anatomical studies on the retarded development of the occipital lobe in the dog and cat due to the lack of optical stimulation. *Arch. f. Psych.*, xxxiii., 2.

597. **Hanke.** The rudimentary eye of the European mole. *Graefe's Archiv*, li., 1, p. 321.

V.—PHYSIOLOGY.

598. **Ovio.** A critical and experimental study of the nutrition of the crystalline lens. *Arch. di Ottalm.*, viii, 1–2 and 3–4.

599. **Angelucci.** Researches on the mechanism of pupillary movements. *Rev. génér. d'opht.*, 1900, 10, p. 434.

600. **Roubinovitsch.** The variations of pupillary diameter as related to intellectual effort. *Congrès de Psych.*, Paris, 1900.

601. **Schoute.** The width of the diffusion circles on the retina. *Ned. Tyd. v. Geneesk.*, 1900, ii., No. 20.

602. **Hermann.** The optical projection of the retinal meridians on a plane perpendicular to the primary position of the line of vision. *Arch. f. Physiol.*, 78, 1 and 2.

After a historical review of the literature concerning the nutritrition of the lens OVIO (598) calls attention to the discrepancies in the various experiments and observations, and then records his own experiments which consisted in the subcutaneous injection of ferrocyanide of potassium, iodide of potassium, and uranin in frogs and rabbits, and in the injection of the same substances into the vitreous of rabbits. The same injections were made into the vitreous and anterior chamber of enucleated ox eyes. Also, carefully isolated lenses from the frog, rabbit, and ox were dipped into various solutions.

After large subcutaneous injections of iodide of potassium and uranin, these substances were discovered in the lens, while ferrocyanide of potassium could be detected in the aqueous humor only. Liquids injected into the vitreous passed first into the anterior chamber and then into the lens, gradually extending toward the nucleus without following any particular course or current. The entrance of the surrounding liquid into the lens takes place in a way similar to diosmosis. KRAHNSTÖVER.

ANGELUCCI (599) in an interesting paper seeks to explain the mechanism of pupillary reaction in accordance with the neuron

theory. He believes that dilatation and contraction of the pupil come about through dynamogenic or inhibitory effects. It has not yet been proven that there is a neuron connecting the cerebral cortex with the centre for pupillary contraction located in the midbrain. The latter centre probably lies in the Edinger-Westphal nucleus of the oculomotor (Bernheimer). A primary neuron connects the Edinger-Westphal nucleus with the ciliary ganglion. Section of the oculo-motor trunk leads only to the extension of the descending degeneration to the latter ganglion (Apolant, Lodato), which according to Angelucci belongs to the sympathetic. From this ganglion a neuron extends to the ganglion cells in the choroid from which a third terminal neuron passes to the fibres of the sphincter and ciliary muscles.

Contraction of the pupil from light stimulus or with convergence is explained by a transference of the stimulus to the first neuron and its continuance along the course of the second and third neurons belonging to the sympathetic. The mydriasis due to irritation of the skin is explained by Angelucci as being caused by inhibition of the function of the first neurons. This explanation is strengthened by the fact that stimulation of the ischiatic causes dilatation of the pupil even after section of the cervical sympathetic. The trigeminus has no direct influence upon pupillary action, and stimulation of it has no effect if the oculomotor and cervical sympathetic have been divided. The myosis following section of the trigeminus is explained by Angelucci as resulting from the simultaneous injury of the pupil-dilating sympathetic fibres running in this nerve. The existence of a cortical centre for the pupil-dilating fibres has not yet been definitely proven; in the dog, cat, and monkey, however, stimulation of a particular part of the cortex causes dilatation of the pupil on the other side. Stimulation of the cervical sympathetic causes dilatation of the pupil since it acts in an inhibitory way upon the pupillary-contracting fibres. In the myosis following section of the cervical sympathetic, the influence of these nerves upon the blood-vessels of the iris plays only a minor rôle; the myosis is due chiefly to the lack of inhibitory action exercised by the fibres of the cervical sympathetic upon the pupillary-contracting fibres. BERGER.

From ROUBINOVITSCH'S (600) investigations it appears that in most persons mental effort, such as calculating and the like, is followed by a dilatation of the pupils and sometimes later by myosis. There is perhaps a direct influence of the cerebral cor-

tex upon the pupil. Haab's cortical reflex seems to Schwarz to be due to accommodation when the attention is fixed upon the object seen. BERGER.

The spherical aberration caused by the cornea, which is one of the sources of diffusion circles upon the retina, cannot be determined by physical methods, according to SCHOUTE (601).

Since Volkmann's method is not above criticism, Schoute has endeavored to study the diffusion figures by skiascopy, examining an eye by skiascopy while it fixes the perforation of the mirror. The author gives a table which shows that the images thrown on the peripheric portion of the retina are but little less sharp than those thrown on the centre. JITTA.

VI.—REFRACTION AND ACCOMMODATION.

602a. **Selenkowsky.** The depth of the anterior chamber and the curvature of the cornea in various states of refraction and at various ages. An attempt to measure the depth of the anterior chamber in glaucoma. From Professor Bellarminoff's clinic. *Wratsch*, 1890, No. 41.

603. **Straub.** The normal refraction of the human eye. *Zeitschr. f. Psych. u. Phys. d. Sinnesorgane*, xxv., p. 78.

604. **Guttmann.** A second case of double refraction due to nuclear sclerosis. *Centralbl. f. prakt. Augenheilk.*, xxiv., p. 297.

605. **Ostwald.** On disturbances of the light sense and erythropsia after extraction of the lens in myopia. *Beiträge z. Augenheilk.*, xlv., p. 45.

The ophthalmometric and ophthalmoscopic measurements of SELENKOWSKY (602a) gave the following average figures: The radius of curvature of the cornea in emmetropia at all ages = 8.007, in myopia = 8.003, and in hyperopia = 8.009. The variation in the radius of curvature in different states of refraction depends not upon the degree of ametropia but on the character of the ametropia. Age affects the curvature but slightly. At every age the anterior chamber is deeper in myopia and shallower in hyperopia than it is in emmetropia. The mean depth of the anterior chamber diminishes somewhat in middle life and considerably in old age. The difference between the actual and the apparent depth of the chamber is 0.44–0.57, or, on an average, 0.5 *mm*. In glaucoma the radius of curvature of the cornea is greater and the chamber is from 1–1.5 *mm* shallower. The decrease in depth of the chamber seems to stand in direct relation with the intraocular tension. HIRSCHMANN.

STRAUB (603) found in his investigations that emmetropia is to

be regarded as the normal state of refraction. From his numerous observations, made with the assistance of others, he comes to the following conclusions:

1. The normal refraction undergoes variations in life which are for the most part only apparent, being produced by the tone of the ciliary muscle. Only at the beginning and end of life is the change an actual one.

2. The normal refraction of the eyes of the new-born is not constant but varies between wide limits. With growth these limits of variation approach each other.

3. Nature strives to attain the ideal refraction in which the eye at rest is focused for distant objects (emmetropia). In a small number of cases this is accomplished by an accurate regulation of the length of the axis and of the refracting power. In most cases the refraction is somewhat too low (normal hyperopia), and is made up for by an accurately gauged tone of the ciliary muscle.

4. Emmetropia is more common in the higher walks of life than in the lower. One should not include here the pathological cases in which the goal is past and myopia is produced. JITTA.

GUTTMANN's (604) case was one of unusual sclerosis of the nucleus of the lens which caused a difference of 6 D between the refraction of the centre and the periphery of the lens, thus producing a uniocular anisometropia.

OSTWALD (605) observed in a series of cases in which the lens was removed for high myopia, disturbances of the light sense. They differed from ordinary hemeralopia in that after a short period of adaptation there was reached the equivalent of the lower excitation threshold of the eye retaining its lens and being more sensitive to light. There is evidently an increased dissimilation, but not a diminished assimilation of the visual substance. In connection with this is the symptom of erythropsia which also is observed in these cases.

VII.—MUSCLES AND NERVES.

606. **Strszeminsky.** A case of recurrent oculo-motor paralysis. *Wratsch*, 1900, Nos. 34, 35.

607. **Barneff.** A contribution to the study of congenital ophthalmoplegia. *Thèse*, Bordeaux, 1900.

608. **Hofmann** and **Bielechofsky.** The value of the inclination of the head in the diagnosis of paralysis of the elevators and depressors of the eye. *Graefe's Archiv*, li., 1.

609. **Moebius.** Periodic paralysis of the oculo-motor. *Deutsche Zeitschr. f. Nervenk.* xvii., 3–4.

STRSZEMINSKY (606) describes a case of left-sided paralysis of all the branches of the oculo-motor nerve in a girl of nineteen, previously healthy and of healthy parentage. The first attack, which lasted two weeks, came on at the age of sixteen. A second attack lasting two weeks came on sixteen months later. A third attack lasting twenty days, came on fourteen months later, and a fourth, nine months later, affected only the extrinsic muscles and lasted nineteen days. In the intervals there was no evidence of paralysis. The author gives a detailed description of the clinical picture of this form of disease based on his case and those described in the literature. HIRSCHMANN.

Sections VIII.–XII. Reviewed by DR. R. SCHWEIGGER.

VIII.—LIDS.

610. **Galliard.** Acute idiopathic œdema of the lids. Soc. méd. des hôpitaux de Paris, Nov. 30, 1900.

611. **Maklakoff.** A case of peculiar bacillary chronic inflammation of the Meibomian glands. *Wjest. Ophth.*, Nov.–Dec., 1900, p. 568–579.

612. **Hunsche.** The presence of demodex folliculorum on the eyelids, and their relation to affections of the lids. *Münch. med. Wochenschr.*, 1900. Nov. 25, p. 1563.

613. **Hirsch.** On a previously undescribed affection of the outer angle of the lids. *Centralbl. f. prakt. Augenheilk.*, xxiv., pp. 328 and 357.

614. **Michel.** Clinical contributions to the knowledge of rare affections of the skin of the lids and conjunctiva. *Arch. f. Augenheilk.*, xlii., p. 1.

615. **Angelucci.** A new operative procedure for paralytic ptosis. *Arch. di Ottalm.*, viii., 3–4.

616. **Neuberger.** Synchronous movement of the drooping upper lid with lateral movement of the ball. *Münch. med. Wochenschr.*, 1900, p. 1611.

617. **Goldberg.** Hysterical ptosis. *St. Petersburger med. Wochenschr.*, 1900, No. 42.

618. **Hochheim.** A contribution to the knowledge of symmetrical tumors of the lid and orbit. *Graefe's Archiv*, li., p. 347.

619. **Wingeroth.** A contribution to the knowledge of symmetrical tumors of the eyelids. *Graefe's Archiv*, li., p. 380.

620. **Wagenmann.** A cavernous angioma of the choroid with extensive telangiectasis of the skin. *Graefe's Archiv*, li., p. 543.

GALLIARD (610) reports two cases of acute œdema of the eyelids in children, which in his opinion were of arthritic origin. In one case there were at the same time a hydrathrosis of the knee-joint, and a papular erythema of the lower extremities. In the discussion BARIÉ and DU CASTEL spoke of the connection of acute œdema of the lid with affections of the digestive tract or toxic articles of diet. Acute œdema may also appear in connection with urticaria.

The characteristic features of the disease which MAKLAKOFF (611) describes consisted in thickening of the tarsus and margin of the lid, widening of the ducts of the Meibomian glands, and the outpouring from them of a thick, fibrinous pus. The course was chronic. The patient, aged sixty-one, had suffered from atrophic rhinitis with ozæna for seven or eight years, and the eye affection dated from the same time. MAKLAKOFF found the ozæna bacillus both in the secretion from the glands and on the nasal mucosa. Former observations have shown that this bacillus is rarely found in the healthy eye. The author believes that the normal liquid in the conjunctival sac kills the bacillus, and that in the given case a previous affection of the Meibomian glands furnished a favorable medium for the bacillus. Experiments on rabbits showed it to be pathogenic only when introduced into the vitreous. HIRSCHMANN.

HUNSCHE (612) found in examining epilated lashes from healthy persons and corpses, and also microscopic sections through the lid, stained with hematoxylin-eosin, that demodex folliculorum is almost constantly found in the healthy lid, and he denies the existence of blepharitis acarica.

HIRSCH (613) observed in several middle-aged patients that the 3—6 lashes at the outer end of the upper lid were very long and curved back so that they entered the outer commissure and thus caused irritation of the conjunctiva. There was never entropium or trichiasis, and the bilateral nature of the affection indicated that the commissures were abnormally formed. The irritation produced small granulations on the lower lid. Epilation was not always sufficient to relieve the condition permanently, and excision of the lashes or the employment of electrolysis are preferable.

MICHEL'S (614) first case was one of retention cyst of the sweat glands of the skin of the lids and face in a patient of fifty-five who had been affected for at least twelve years with unilateral sweating of the entire left side of the face and neck. The sharply circumscribed little vesicles with clear contents caused some twitching when overfilled. Other symptoms on the part of the cervical sympathetic were ptosis, miosis, and diminution of tension. This cutaneous affection is known in the English literature as dysidrosis or pompholyx, and consists not in a disturbance of the ducts of the glands but in a circumscribed inflammation of the papillæ.

His second case was one of typical herpes facialis of the lower lid.

His third and fourth cases presented in the conjunctiva and in the outer skin, accompanying syphilitic efflorescences, rapidly appearing rounded infiltrations and nodules of grayish-yellow or pure yellow color, which resembled enlarged conjunctival follicles undergoing degeneration, or the nodules in the neighborhood of tuberculous ulcers of the conjunctiva. In Case 3 they developed on the conjunctiva after the healing of an eczema impetiginosum necroticum of the lids simultaneously with the primary lesion. In the fourth case they appeared near a pustular syphilide of the bulbar conjunctiva at the limbus. Michel supposes that the nodules represent a severe reaction of the tissues, and perhaps regularly accompany syphilitic affections of the conjunctiva, and thus may be regarded as of diagnostic value.

Case 5 was one of lues tuberosa serpiginosa of the skin of the lids, face, head, neck, lower jaw, and forearm that had run its course, producing a cicatricial ectropium so pronounced that only a portion of the opaque cornea could be seen between the wall-like swellings of the conjunctiva.

ANGELUCCI'S (615) operation for securing mobility of the upper lid in cases of ptosis consists in uniting the tarsus with the muscles of the brow through the medium of the tendon of the levator palpebræ. After shaving the brow a curved incision 2.5 *cm* long is made 2–4 *mm* below the lower margin of the eyebrow and parallel with it. The skin is then dissected down to the upper margin of the tarsus. The orbicularis fibres are divided 2–3 *mm* above the margin of the tarsus and thus the tarsus and the levator tendon attached to it are laid bare. The tendon is perforated near its inner and outer margins and a squint hook passed through. The tendon is now divided 4 *mm* above the tarsal margin, and near the margin of the section two loops of a doubly armed suture are passed from behind forward so that the two loops appear near each other on the posterior surface. These are knotted on the posterior surface in order to avoid laceration, and then the four needles are passed through the muscular masses of the region of the brow that have been dissected up, and are brought out through the skin 2–3 *mm* above the eyebrow. Each needle is now entered at its point of exit and passed subcutaneously to the point of exit of the other needle and then the two ends are tied in a bow knot. The same procedure is followed with the two ends of the second loop. After the knots are tied the lid margin should stand at the height of the upper pupillary margin. Twenty-four

hours later the position of the lid may be corrected by tightening or loosening the sutures, and the bow knots replaced by double knots.

Three cases operated upon have given successful results, and attention is called to the perfectly normal excursion of the upper lid upwards and backwards. KRAHNSTÖVER.

NEUBURGER (616) offers an example of synchronous action of the ocular muscles. The patient had tabes with incomplete paralysis of the right oculo-motor nerve; mydriasis, ptosis, and paresis of the internal and superior recti. The lid rose above the corneal margin when the eye was adducted, even in a purely horizontal direction, and it fell when the eye was abducted. On the left side there was ptosis with suggestions of the same symptoms. In looking upward both lids were raised well although the right eye could be turned but little above the horizontal line.

HOCHHEIM (618) cites the literature of symmetrical orbital tumors after describing a case in which the tumor on one side was removed and submitted to him for microscopic examination. These tumors arise usually in patients with leucæmia or pseudoleucæmia, and rarely by metastasis from maglignant tumors. The simple lymphomas are benign, and they appear as local tumors of the orbit or lids, encapsulated or diffuse.

The leucæmic tumors which occur mostly in fatal cases can be recognized by the determination of the condition of the blood. Internal medication is rarely of benefit, and operation is contraindicated on account of the tendency to hemorrhage. Pseudoleucæmic symmetrical tumors of the lids and orbit react in part to internal medication, and in part must be removed by operation. The clinical complexus includes diffuse affection of the lymphatics and of the bones, which become soft and spongy. Frequently the ocular symptoms are among the earliest.

In the writer's case the blood was normal, and it was a question whether the affection was not elephantiasis or sarcoma, since these may resemble microscopically pseudoleucæmic lymphoma, but if the growth had been other than lymphoma it would have increased in size in the time it was under observation.

WAGENMANN'S (620) patient had a large growing nævus of the left cheek, lids, and conjunctiva. The left eye also presented changes which suggested the presence of a tumor in the interior. The eye was enucleated, and was found to contain an ossifying angioma of the choroid without evidences of malignant degenera-

tion. The eye had been blind since childhood, and later it became smaller, the cornea was opaque and uneven, the iris atrophic, the lens chalky, and the retina detached. In the choroid, near the disc, was a vascular tumor with a bony shell over its surface. There were no signs of sarcoma. This cavernous angioma was doubtless congenital, the other changes in the eye being of a secondary nature.

IX—LACHRYMAL APPARATUS.

621. **Haehnle.** Two cases of tumor of the lachrymal gland. *Ophth. Klinik*, 1900, No. 24.

622. **Koenigshöfer.** Two cases of tumor of the lachrymal gland. *Ibid.*

623. **Snegireff.** A case of endothelioma of the lachrymal gland. *Wjestnik Ophth.*, xvii., p. 493.

624. **Armaignac.** On lachrymal tumor. *Ann. d'ocul.*, cxxiv., p. 363.

625. **Eliasberg.** On the question of congenital dacryocystitis. *Wjest. Ophth.*, July–Oct., 1900, pp. 355–366.

626. **Vincent.** Tuberculosis of the lachrymal sac. *Thèse de Lyon*, 1900.

ELIASBERG (625) describes two cases of congenital dacryocystitis. In both the affection was left-sided. The father of one patient was syphilitic. Probing should not be done in these cases. HIRSCHMANN.

X.—ORBIT AND ACCESSORY CAVITIES.

627. **Golowin.** On echinococcus of the orbit. A clinical-bibliographical study. *Zeitschr. f. Augenheilk.*, iv., p. 647.

628. **Reynier.** A pistol ball in the orbit, discovered and extracted by the aid of Contremoulin's apparatus. *Recueil d'opht.*, p. 687, 1900.

629. **Walinzeff.** A new method of temporary excision of the outer wall of the orbit. *Wjestnik Ophth.*, xvii., p. 440.

630. **Barth.** A case of pulsating exophthalmus. *Correspondenzbl. f. Schweizer Aerzte*, 1900, No. 21.

631. **Witzheller.** A case of spongy osteoma of the frontal sinus. *Inaug. Dissert.*, Greifswald, 1900.

GOLOWIN (627) describes a new case of echinococcus of the orbit, with a particularly dense fibrous capsule about the vesicle. He adds to Kramer's article in *Graefe-Saemisch* seventeen further cases scattered through the Russian literature, and several other cases that had been overlooked, as well as three cases of echinococcus of the frontal sinus.

BARTH'S (630) patient was stuck at the inner angle of the eye with a pitchfork, and the wound healed in a week without general symptoms. Three weeks later exophthalmus appeared, which in

six weeks increased 9 *mm*, and was accompanied by paresis of the external rectus. Above the inner angle of the eye a slight whirring sound was heard synchronous with the apex beat, and over the right common carotid it was heard more distinctly. Pulsation of the ball was manifest, and over the entire skull hissing systolic sounds were heard, which stopped when the right common carotid was compressed, but were unaffected by compression of the left carotid. Vision was good. The retinal veins were dilated; the vessels pulsated on slight pressure with the finger. After ligation of the right carotid, the right half of the face was paler for half a day and the pupil larger but responsive. The protrusion diminished gradually, and the pulsation on the right side ceased. The sounds continued in part, and there was also an unexplainable whirring sound on the left side.

With injury of the internal carotid in the cavernous sinus, as one may easily demonstrate on the cadaver, all the nerves may remain intact. The abducens, which projects into the wall of the sinus, is secondarily affected by the increased tension in the sinus. In this case there was possibly an aneurism of the ophthalmic artery also, but the optic nerve remained uninjured.

WITZHELLER (631) records a case of redness and œdema over the frontal sinus, which apparently indicated an acute inflammatory process, but transillumination of the region revealed a slight suppuration in the frontal sinus and also a bony growth. The spongy, bony tumor could not be removed radically, but a radical operation is not necessary in cases of osteoma, for the portion of the remaining growth often shrinks. On the fifteenth day after the operation, cerebral symptoms, with protrusion of the right eye and almost complete blindness, set in, which probably depended upon a non-infectious thrombus of the cavernous sinus, and later passed off.

XI.—CONJUNCTIVA.

632. **Ahlström.** An atypical case of summer catarrh. Fibroma formation on the lid margin. *Klin. Monatsbl. f. Augenheilk.*, xxxviii., p. 662.

633. **Leber.** Conjunctivitis petrificans according to clinical, microchemical, histological, and bacteriological investigations, with observations and remarks on hyaline thrombi, amyloid degeneration, fibrinous infiltration of connective tissue, eosinophilous cells, and a particular sort of amyloid bodies in the conjunctiva. *Graefe's Archiv*, li., 1. 1.

634. **Dor.** Experimental research on the ophthalmias or periodic fluxions of the horse and particularly on the pathogenesis and prophylaxis of the periodic epizoötic ophthalmia of Auxonne. *Jour. de méd. vétér. et de zoötech.*, 1900, p. 569.

635. **Lundsgaard.** Bacteriological researches on conjunctivitis at Copenhagen. *Ann. d'ocul.*, cxxiv., p. 283.

636. **Abelsdorff** and **Neumann.** On post-operative conjunctivitis, with the bacteriological findings. *Arch. f. Augenheilk., Ibid.*, p. 372.

637. **Koenig.** The employment of alcohol in the prophylaxis of blennorrhœa neonatorum. *Inaug. Dissert.*, Marburg, 1890.

638. **Rudin.** Pyoctaninum ceruleum in trachoma and other infectious diseases of the eye. *Wjest. ophth.* July, October, 1900.

639. **Birch-Hirschfeld** and **Hausmann.** Three cases of conjunctival tuberculosis. *Klin. Monastabl. f. Augenheilk.*, xxxviii., p. 634, 731.

640. **Uhthoff.** Remarks on scrofula and tuberculosis, with a contribution to tuberculosis of the conjunctiva. *Berl. klin. Wochenschr.*, 1900, No. 50, p. 1145.

641. **Blessig.** A case of unusual malformation of the eyes: symblepharon totale congenitum, cryptophthalmus oc. sin. (A clinical contribution to the genesis of cryptophthalmus.) *Zehender's klin. Monstabl.*, xxxviii., p. 652.

642. **Krautner.** A case of leucosarcoma of the epibulbar tissue. *Ibid.* p. 767.

In spring catarrh there are usually pavement-like granulations, consisting for the most part of epithelial new formations, on the palpebral conjunctiva and rarely fibromatous formations at the limbus. In AHLSTRÖM'S (632) case, however, there were fibromas on the free margin of the lid, flattened toward the ball, covered with smooth conjunctival epithelium, and having the appearance of fungi cut in half. In number they were about a dozen, and they swelled and grew smaller again with the other symptoms of spring catarrh. Ahlström finally extirpated them and found a connective-tissue stroma with a thin epithelial covering and a round-celled infiltration. After the fibromas were removed the catarrh improved, and the affection was very favorably influenced by iced compresses.

From the three cases reported in LEBER'S (633) exhaustive paper, the following clinical picture may be made up. On a reddened and swollen portion of the conjunctiva, mostly the lower part of the bulbar conjunctiva and the adjoining retrotarsal fold, there appear white opaque spots, projecting slightly above the surface and composed of altered tissue of the conjunctiva itself. These spots gradually increase in extent and depth. The process is observed either in one or in both eyes.

Sometimes the conjunctiva opposite the spot becomes affected while the unaffected parts are scarcely irritated. The subjective disturbances usually are not marked. The irregularly outlined margin of the ulcer has a chalky-white, firm or even stony-hard, dry

base, which can with difficulty be removed from the underlying tissues. In appearance the ulcer resembles that produced by caustics, such as lead solution, and suspicion may arise that the patient has intentionally injured himself. The destruction is so considerable that the completeness of the restoration is often a matter of surprise; sometimes, however, thickening and contraction remain, and even partial symblepharon. The affection is prone to relapse and lasts sometimes for years. The cornea may become ulcerated and thus blindness ensue. Treatment consists in the use of warm fomentations, and the necrotic portions may be excised. Leber thinks it probable that the affection is of local parasitic nature. The calcareous matter infiltrating the conjunctiva was in one case in organic combination, and probably so in a second. In a third case it appeared partly in the form of crystals and partly as a diffuse infiltration. In two appendices Leber describes other but doubtful cases of spotty calcification of the conjunctiva or of recurrent chronic ulceration, and he also reports on the presence of peculiar amyloid bodies in the conjunctiva in cases of conjunctivitis petrificans.

LUNDSGAARD (635) examined ninety cases of conjunctivitis, observed in Copenhagen, in respect to their bacteriology. Although it is not possible from so small a material to draw conclusions as to the relative frequency of the different conjunctival inflammations caused by bacteria, yet it is not without interest to find that certain forms seem to be very rare. The Weeks bacillus was found only three times, the Loeffler bacillus once, and the Morax diplobacillus sixteen times in secretion; in fifteen cases there was pneumococcus infection, and in five gonococcus infection. Besides these micro-organisms only stapylococci were found except in one case in which streptococci were present in a newborn infant. BERGER.

ABELSDORFF and NEUMANN (636) report on a diplococcus infection in three cataract patients of a series operated on within a period of five days. In the beginning the inflammation was severe, but soon subsided under the use of zinc solution. The healing of the wound was not delayed. The diplococcus was found to be the albicans tardissimus (Bumm); it lay extra-cellular, was similar to the gonococcus, and did not retain the stain in Gram's method, but the cleft was very narrow and the organism grew upon serum agar, urinagar, and slowly upon gelatine plates. It is mostly found on mucous membranes with a layer of stagnant secretion.

RUDIN (638) pencils the palpebral conjunctiva three times a day with pyoctanin solution 1:500 in papillary trachoma, with good effect. It is also of use in catarrhs and corneal ulcers.

HIRSCHMANN.

BIRCH-HIRSCHFELD and HAUSMANN (639) state that in their three cases of conjunctival tuberculosis there was probably a local infection rather than a metastatic one. The source of infection differed. In one case a healthy man of twenty-six was attacked, in the second the patient was suffering from suppurating tuberculous glands, and in the third the patient had lupus of the face and nose. It is shown also that, in persons with conjunctival tuberculosis, eczematous conjunctivitis may run its usual course. The destructiveness of the process varies with the virulence of the bacilli and the general condition of the patient. In some cases the appearance of the patient may resemble that of trachoma. In suspicious cases curetting and the use of the actual cautery are indicated.

Phlyctenulæ are most frequent in scrofulous or tuberculous persons, yet UHTHOFF (640) is convinced that in older persons with phlyctenulæ a certain percentage, though small, are free from scrofula. Bacteriological examinations have shown with certainty that phlyctenulæ are not of tuberculous nature. Uhthoff has obtained a febrile reaction after the injection of tuberculin in about 80 per cent. of severe and obstinate cases of scrofulous eye affections, indicating the existence of tuberculosis in the body. Although this percentage may be too high, Stephenson's 32 per cent. is too low.

A child two years of age, with a vertically furrowed nose and absence of teeth, had, according to BLESSIG (641) no free upper lid on the right side. The skin of the face passed down from above, without eyebrows or lashes, to the sclera and cornea (symblepharon). The lower lid was nearly normal though somewhat everted. The ball was of normal size. On the left side also brow and lashes were wanting, and there was no trace of a palpebral aperture (cryptophthalmus). Beneath the skin in the temporal region of the eye there was a soft elastic tumor, and in the nasal region a spherical tense elastic formation about the size of the right eye and moving with the latter. An attempt was made to open the conjunctival sac on the left side. Temporally fat only was found, but to the nasal side was a conjunctival sac several centimetres deep, in the depths of which appeared a clear, large, strongly curved cornea through which, the iris being absent, the

red fundus could be seen. The ball was smaller than the other. The conjunctiva daily united more and more, and in three weeks the newly formed palpebral aperture narrowed down to a small fistula.

This case shows that the malformations known as symblepharon and anchyloblepharon stand in close relation with typical cryptophthalmus, and may exist together with the latter in the same person. The eyeball is almost always abnormal. Cryptophthalmus may arise from lack of development of the lid, or from a fœtal adhesion of the lids with each other or with the ball.

When a conjunctival sac is present the cryptophthalmus can arise only through adhesion of the lids or the failure of the lids to separate.

In KRAUTNER'S (642) case there had existed for some months a leuco-sarcoma just above the limbus of the cornea in a girl of five. It was as large as a bean, hard, and adherent to the conjunctiva, sclera, and tendon of the superior rectus. When dissected out and examined microscopically there was an indistinct capsule, and the tumor consisted of spindle cells with vascular spaces among them. A few months after the operation there had been no recurrence.

XII.—CORNEA, SCLERA, ANTERIOR CHAMBER.

643. **Szili.** On disjunction of the corneal epithelium. *Graefe's Archiv*, li., p. 486.

644 **Majewski.** On the factors influencing astigmatism after cataract extraction. *Postemp. ocul.*, 1900, Nos. 8 and 9.

645. **Baiardi.** Researches on the influence exerted by the adnexa of the eye on the form of the human cornea. *Giorn. della R. Acc. de Med.*, Turin, 1900.

646. **Silex.** On the nature of glaucomatous opacity of the cornea. *Arch. f. Augenheilk.*, xli., p. 125.

647. **Wicherkiewicz.** On some rare forms of syphilitic keratitis. *Ann. d'ocul.*, cxxiv., p. 337.

648. **Gentilini.** Three new cases of keratitis aspergillina. *Beiträge z. Augenheilk.*, 45, p. 115.

649. **Strachow.** Parenchymatous keratitis in acquired syphilis. *Wjest. Ophth.*, xvii., p. 485.

650. **Zaunert.** On the etiology of the affections of the joints occurring with parenchymatous keratitis. *Inaug. Dissert.*, Greifswald, 1900.

651. **Petit.** On the early perforation of Descemet's membrane in hypopyon keratitis. Microscopic examination of an eye with a serpent ulcer. *Ann. d'ocul.*, cxxiv., p. 264.

652. **Koller.** Two cases of dermoid of the cornea. *New-Yorker med. Wochenschr.*, xii., 11, p. 623.

Szili (643) reports cases in which after the apparent healing of superficial injuries of the cornea, there is a periodical casting off of epithelium at the same spot with more or less severe signs of irritation. Hansen in 1872 called the affection intermittent vesicular neuralgic keratitis. Grandclément, in 1888, called it traumatic keratalgia, and Biber, according to Haab's observations, called it bullous keratitis. Furthermore, other authors have described the affection. Szili has himself suffered from it, and has studied it in others also. The typical attack of pain comes on when the patient wakens and opens the eye, the injured spot being adherent to the lid. This pain can be lessened or prevented by opening the eye carefully and slowly. The recurrent attacks may come on soon after the injury, or they may be postponed for months.

When an attempt is made to remove the vesicle or the loose shreds, the entire epithelial layer can be pulled off without pain. It regenerates quickly, however, and often in twenty-four hours is loose again. The repeated removal of the loose epithelium finally leads to recovery.

In fresh cases of glaucoma the œdema of the anterior layers of the cornea has been demonstrated beyond question, but other cases are known in which the cornea exhibited no œdematous spaces. It has been ascertained also that external pressure on the cornea will bring about the radially arranged doubly refracting markings which cause opacity. Silex (646) has now increased the intraocular tension in rabbits' eyes by injecting salt solution and thereby produced various degrees of opacity of the cornea, altogether similar to those seen in glaucoma. But since this picture can be changed within a minute by altering the pressure, it cannot depend upon œdema but rather upon a change of form. Corresponding to this view, the major part of the glaucomatous opacity disappears after opening the anterior chamber. In acute glaucoma Silex believes this stretching of the cornea to be the cause of the apacity.

In children with hereditary syphilis, Wicherkiewicz (647) has observed the presence of solitary and grouped nodular infiltrations which differ from corneal phlyctenulæ in their greater prominence, yellow color, and lack of a tendency to ulcerate. Superficial vessels are wanting, but deep in the parenchyma are found vessels running parallel. Furthermore, Wicherkiewicz describes a marginal parenchymatous keratitis which, like the nodular syphilitic keratitis, is cured by mercurial inunctions. Berger.

The clinical picture of keratitis aspergillina which GENTILINI (648) describes, is that of an ulcer of the cornea with an elevated, whitish, rough, crumbling mass upon it, which always appears dry, as if not moistened by the tears. In the centre of the ulcer this deposit is firmly attached and must be cut or burned out, local applications and subconjunctival injections being of no avail. The cornea is opaque only in the neighborhood of the fungus mass. The author believes that the injury and the infection with the aspergillus must occur simultaneously and in the absence of cocci, for these displace the aspergillus.

ZAUNERT (650) gives some statistics from Schirmer's clinic in regard to parenchymatous keratitis and affections of the joints. Among thirty-five cases of keratitis, there was inflammation of the knee joints in five, an accidentally high percentage. In none of the five was there any suspicion of tuberculosis, but in all hereditary syphilis was demonstrated or suspected. Even when the affection of the joint is actually tuberculous, the keratitis may be due to hereditary syphilis.

PETIT (651) examined, in Axenfeld's laboratory, a case of hypopyon keratitis in which perforation of Descemet's membrane had been produced by an abscess in the posterior layers of the cornea. Petit believes, with Elschnig, that the perforation of Descemet's membrane is due to the histological action of the leucocytes. Whether the perforation generally precedes that of the other layers, as Fuchs believes, or follows, Petit regards as undetermined.

Sections XIII.–XVIII. Reviewed by DR. O. BRECHT, Berlin.

XIII.—LENS.

653. **Heddaeus, Julius.** Extraction of senile cataract through the posterior chamber. *Klin. Monatsbl. f. Augenheilk.*, xxxviii., p. 737.

654. **Zaumrawkin.** A case of spontaneous absorption of a cataract. *Wjest. ophth.*, xvii., p. 449.

655. **Merz-Weigandt.** A case of lamellar cataract due to injury. *Centralbl. f. prakt. Augenheilk.*, xxiv., p. 353.

656. **Levy, A.** Air bubbles in the lens. *Klin. Monatsbl. f. Augenheilk.*, xxxviii., p. 837.

657. **Fuchs.** Detachment of the choroid after cataract extraction. *9th Int. Ophth. Congress at Utrecht*, 1899. p. 199.

658. **Kraisky.** On the development of cataract in patients with malaria. *Wjest. ophth.*, 1900, Nov.–Dec., pp. 561–568.

659. **Knapp, Paul.** On the healing of injuries of the lens in fishes. *Zeitschr. f. Augenheilk.*, iii., 6, p. 510.

660. **Knapp, Paul.** On the healing of injuries of the lens in the rabbit and the goat. *Ibid.*, iv., p. 282.

HEDDAEUS (653) recommends the extraction of cataract with or without the capsule through the posterior chamber. The section may be made either from outward inward with a special linear lance knife, or from inward outward with a Graefe knife. The author thus far has experimented only on animals' eyes and eyes in the dead subject.

The observation of MERZ-WEIGANDT (655) is noteworthy, since it shows that a unilateral lamellar cataract may develop from a trauma. In this case the eye was struck with the lash of a whip. Some time later there was found a faint scar near the limbus with a corresponding coloboma of the iris, and punctate and striated opacities of the lens. A faint reflex could be obtained through the centre while the periphery was quite clear. The other lens was perfectly transparent.

LEVY (656) observed in a man of thirty-five, after a perforating injury of the cornea and lens, a spherical bubble of air in the lens, which disappeared in six days, when a stellate opacity of the posterior cortex cleared up also. The foreign body could not be seen, and probably lay in a clot of blood in the vitreous.

FUCHS (657) adds to the eleven cases of detachment of the choroid following cataract extraction six new cases of his own and three following iridectomy. The clinical picture is as follows: After a normal flap extraction with iridectomy without any assignable cause, some day the anterior chamber is found to be shallow and the eyeball soft. When illuminated, there is seen one or more dark, hemispherical projections in the vitreous, mostly to the nasal side just behind the ciliary body. The surface is smooth, non-vascular, and non-undulating. After this condition has lasted some time, the projection recedes, the anterior chamber becomes deeper, and the tension normal. An acute attack of glaucoma may come on, but this yields to eserine or iridectomy. Otherwise the prognosis is favorable. The retina remains adherent to the choroid, and continues to functionate, though imperfectly. The subchoroidal mass was found to be a watery liquid with a few red and white blood corpuscles. The author's explanation is as follows: In the operation the attachment of the ciliary body is disturbed, so that aqueous humor may pass back behind the choroid. When the choroid projects forward, the aqueous from the anterior chamber flows back, and thus the anterior chamber becomes shallow. The detachment is cured when the spaces in the ciliary body close by cicatrization. Then the anterior chamber

regains its normal depth, and a transitory increase in tension may occur.

KRAISKY (658) observed four cases of bilateral cataract in children, aged four and one-half, twelve, and sixteen years, all of whom suffered from chronic malaria. The so-called malarial choroido-retinitis was not found in any of the cases.

HIRSCHMANN.

P. KNAPP (659) has continued his studies on the goldfish. Injuries of the lens lead only to circumscribed superficial opacities. Healing occurs through the formation of a capsular cataract.

XIV.—IRIS.

661. **Haase.** A case of spontaneous cure of an irido-dialysis. *Inaug. Dissert.*, Kiel, 1900.

662. **Schweigger, R.** Ciliary processes in the pupillary region. *Arch. f. Augenheilk.*, xlii., p. 171.

663. **Hopf.** On the pathological anatomy of congenital aniridia. *Inaug. Dissert.*, Jena, 1900.

SCHWEIGGER (662) saw, in mydriasis, the ciliary processes attached to a shrunken congenital cataract in a small weak-sighted eye with nystagmus. In order to remove the cataract, the processes were detached, when they retracted somewhat. The operative interference with the processes was painful, but without ill effects.

XV.—CHOROID.

664. **Wagenmann.** On a cavernous angioma of the choroid with extensive teleangiectasis of the skin. *Graefe's Archiv*, li., 3, p. 532.

665. **Cattaneo.** Post-traumatic tuberculous iridocyclitis in a child dead of basilar meningitis. *Soc. med.-chir. di Bologna, Il Policlinico*, vi., 35, p. 1103.

666. **Schultz.** Sarcoma of the choroid leading to phthisis bulbi. *Arch. f. Augenheilk.*, xlii., p. 56.

WAGENMANN'S (664) case was one of cavernous angioma of the choroid near the optic disc and partially overlying it, 13 *mm* broad and 6 *mm* thick. It was associated with the following conditions: phthisis bulbi, detachment of the retina, atrophy of the iris, calcification of the lens, etc. The tumor consisted exclusively of vessels of different size and was covered with a shell of bone. There was no evidence of sarcomatous growth. The patient had in the skin of the left cheek a large cavernous angioma with a fissured surface. Both were doubtless congenital, while the other conditions in the eye were secondary.

CATTANEO'S (665) patient was a girl of six in whom a tubercu-

lous iridocyclitis developed twenty days after a blow on the eye which necessitated enucleation two weeks later. Two months afterwards the child died of meningitis. Since the patient had previously suffered from a middle-ear affection the author regards this as having been the focus of infection both for the eye and the brain. No bacteriological examinations or inoculation experiments were undertaken. KRAHNSTÖVER.

SCHULTZ (666) was able to follow a sarcoma in a woman of twenty-six from its inception. The inflammation came on suddenly and led to phthisis bulbi, and, on account of the great pain, the ball was enucleated. The tumor was a round-celled sarcoma of the choroid that had become almost completely necrotic. The author thinks that an endarteritis of the vessels of the tumor led to hemorrhage, whence the necrosis, and the metabolic processes led to irido-choroiditis which finally ended in phthisis.

XVI.—VITREOUS.

667. **Wessling.** A case of purulent infiltration of the vitreous proceeding from a scar following operation. *Inaug. Dissert.*, Jena, 1900.

668. **Bening.** A contribution to the subject of hemorrhage into the vitreous, with special reference to eight cases of spontaneous recurrent hemorrhage into the vitreous. *Inaug. Dissert.*, Giessen, 1900.

668A. **Terson.** On hemorrhage into the vitreous in the course of cerebral hemorrhage. *La clin. opht.*, No. 22, 1900.

BENING (668) found in seven of the eight cases he reports, chorio-retinitic changes which he regards as being the cause of the hemorrhages. In two cases the hemorrhages were from the retinal vessels.

XVII.—GLAUCOMA.

669. **Horstmann.** On glaucoma simplex. *Arch. f. Augenheilk.*, xlii., p. 114.

670. **Terson.** Spontaneous expulsive hemorrhage. *Bull. de la Soc. d'opht. de Paris*, No. 6, 1900.

671. **Abadie.** On iridectomy for glaucoma. *Arch. d'opht.*, xx., 11, p. 561.

672. **Schoenemann.** A contribution to the therapeutics of congenital and infantile hydrophthalmus. *Arch. f. Augenheilk.*, xlii., p. 174.

HORSTMANN (669) gives the histories of nine cases of so-called glaucoma simplex (total excavation, diminution of acuteness of vision, and contraction of the field), which presented no signs of irritation whatsoever, and all gradually led to blindness, although iridectomy was done in four cases. In contrast with these

he gives the histories of four similar cases in which, however, there were slight signs of irritation with increased tension and in which iridectomy was employed successfully in three. The author suggests, therefore, that so-called glaucoma simplex be divided into two groups, and that cases with cupping to the margin of the disc, diminished vision, and contraction of the field, be considered cases of chronic inflammatory glaucoma whenever the slightest signs of inflammation appear — such as opacity of the cornea, cloudy vision, and the like. When, however, inflammatory signs are permanently absent, he would use Graefe's old designation, "amaurosis or amblyopia with cupping of the disc." In the former category, iridectomy is always indicated and mostly is of service; in the latter, it is not indicated, since it never is of service and often is injurious.

TERSON (670) presented a woman of seventy-one, who, in the course of a hemorrhagic glaucoma, suffered a spontaneous rupture of the cornea, which was followed by a severe hemorrhage. But few similar cases are on record. BERGER.

According to ABADIE (671), iridectomy is indicated, and is followed by good results, in acute glaucoma and in the various subacute forms, which he groups under the designation, "glaucoma with opacity of the cornea," to which intermittent glaucoma also belongs. In simple chronic glaucoma (apart from some forms of glaucoma in young persons, in which iridectomy may be tried), myotics should be employed first, and later resection of the sympathetic. The latter is to be employed in other forms of glaucoma when iridectomy is contra-indicated. According to Abadie's view glaucoma is a disease of the sympathetic.

v. MITTELSTÄDT.

SCHOENEMANN (672) reports on thirteen eyes with hydrophthalmus in young persons, treated by means of iridectomy. In two cases the affection first developed at the ages of five and seven respectively. The operation was always successful, and the results were followed as long as six years. Iridectomy should be done early, a peripheric section being avoided.

XVIII.—SYMPATHETIC OPHTHALMIA.

673. **Grooz.** Clinical reports: 1. Uveal tuberculosis running the course of sympathetic inflammation. 2. A case of recovery from sympathetic inflammation. *Owosi Hetilap.*, 1900, p. 43.

674. **Gasparrini.** A case of sympathetic ophthalmia cured by the injection of antidiphtheritic serum. *Ann. di Ottal.*, 1900, p. 509.

675. **Selenkowsky.** On the pathogenesis of the sympathetic inflammations. From the laboratory of Professor Bellarminoff's clinic and the bacteriological laboratory of Professor Tschistowitsch. Pp. 230, with two phototype plates, St. Petersburg, 1900.

SELENKOWSKY (675) undertook a series of experiments to test the theories of Graefe-Müller, Schmidt-Rimpler, Panas, and Deutschmann. He sought first to determine the relation of the lymph current in the optic nerves to that in the eye, in order to find whether it was possible for toxins to pass from one eye to the other, and then studied the effect of toxins on the development of sympathetic inflammation. His eighty-seven experiments, with the exception of two, were performed upon rabbits.

Experiments designed to produce sympathetic imflammation in one eye by irritating the other in various ways were always negative. In repeating Moll's experiments, the author injected cultures of the bac. pyocyaneus, the bac. coli communis, and the bac. prodigiosus into one of the veins of the ear. In seven cases one eye was mutilated before the injection. Later the micro-organisms were found only in the injured eye in three cases, in both eyes in three cases, and in neither eye in one case. Of eight cases of general infection without mutilation of one eye, four were negative, in one the micro-organisms were found in one eye, and in three cases in both eyes. These micro-organisms were found only in the aqueous, and in no case were there signs of inflammation. Thus the hypothesis of Schmidt-Rimpler and Panas was not supported by the experiments.

Deutschmann's experiment of injecting pure cultures into the vitreous and subvaginal space of the optic nerve was repeated with various micro-organisms. In no case did the injection into the vitreous produce inflammation in the other eyes. Injection into the subvaginal space caused general infection, and if micro-organisms were found in the second eye, meningitis also was present.

In order to study the lymph current in the intervaginal space, injections of 5 % Berlin blue solution were made. The stain passed forward along the suprachoroidal space to the ciliary body of the eye on the same side, and backward past the chiasm and down to the other eye in some cases. After injections into the vitreous the stain passed along the central vessels into the intervaginal space, and after several days reached the intervaginal space of the other eye. From this, and the statements of other

experimenters, the author concludes that soluble substances in the vitreous or suprachoroidal space of one eye may pass along the nerves and chiasm to the other eye.

The important part of the paper records the experiments in which toxins were injected into the vitreous or the intervaginal space of the nerve. The positive results of his experiments justify us, in the author's opinion, in believing that toxins are the sole cause of sympathetic ophthalmia. His conclusions are as follows : 1. When the toxin of the staphylococcus pyogenes aureus is injected into the peripheric portion of the optic nerve, it passes down to the eye, and causes inflammatory changes both in its anterior and posterior segments. 2. When a small quantity is injected into the intervaginal space, close to the eyeball, it passes into that eye, and sometimes into the other, and causes inflammatory changes in both segments of the latter. 3. The same toxin repeatedly injected into the vitreous of one eye sometimes passes along the intervaginal space and causes the same inflammatory symptoms in the other eye. 4. These experiments explain many of the obscure points in sympathetic ophthalmia, and make it seem extremely probable that sympathetic ophthalmia in man is due to the passage of toxins developed in the first eye over into the second. HIRSCHMANN.

Sections XIX.–XXII. Reviewed by DR. ABELSDORFF, Berlin.

XIX.—RETINA AND FUNCTIONAL DISTURBANCES.

676. **Schwabe.** The effect of caffein on the visual field in quinine amblyopia. *Arch. f. Augenheilk.*, xlii., p. 47.

677. **De Vries.** Toxic amblyopia from iodoform. *Med. Tydschr. v. Geneesk.*, No. 25, 1900.

678. **Aubaret.** A series of scotomas from observing a solar eclipse. *Gaz. hebd. d. sciences méd. de Bordeaux*, July 1, 1900.

679. **Goldzieher.** Bilateral embolism of the central artery of the retina. *Ung. med. Pr.*, No. 20, 1900.

680. **Jacqueau.** Double homonymous hemianopsia. *Lyon méd.*, Sept. 23, 1900.

681. **Salomonsohn.** Hemianopsia and its localizing diagnostic value. *Deutsche med. Wochenschr.*, Nos. 42 and 43, 1900.

SCHWABE (676) made the following interesting observation. A woman of thirty-three, after taking 1.25 g. of quinine became completely blind. Gradually normal vision was regained with contraction of the field and narrowing of the retinal vessels. Whenever

she drank strong coffee the visual field would become contracted almost to the point of fixation. Tea caused a similar though less marked effect. The ingestion of 0.09 g. of caffein produced the same symptoms. In spite of the use of coffee for years peripheric vision had not suffered permanently.

De Vries's (677) patient, a boy with spondylitic kyphosis of the lower dorsal vertebræ and a gravitation abscess in the thigh, had received repeated injections of 10 % iodoformol. After one injection of 60 g. he had headache, vomiting, and strabismus convergens with nystagmus. On the right side there was a relative central scotoma, and on the left an absolute central scotoma. A diagnosis of toxic amblyopia from iodoform was made. Improvement soon took place. The author found but nine cases reported of amblyopia from iodoform. JITTA.

Salomonsohn (681) reports the following cases:

1. Uniocular hemianopsia with hemiopic pupillary reaction in a patient of twenty-one. Headache and dizziness; later pronounced desire to sleep; failure of smell; optic neuritis; atrophy; L. perception of light; R v = $\frac{6}{9}$, with temporal hemianopsia and hemianopic pupillary reaction. The diagnosis was tumor of the region of the chiasm with lesion of the left nerve or tract. The patient gradually became blind and died. A cyst-adenoma of the hypophysis was found which had destroyed the sella turcica, compressed the chiasm from behind and above, and led to atrophy of the tracts and nerves.

2. Binocular inferior hemianopsia in a woman of thirty. Discs pale, specific peripheric chorio-retinitis. R v = $\frac{6}{60}$. L v = $\frac{6}{18}$. The author assumed the presence of syphilitic lesions compressing the chiasm.

3. Transitory left homonymous hemianopsia after narcosis in a woman of fifty. Three weeks later vision was normal. The cause was thought to be a small hemorrhage in the cortex of the occipital lobe caused by the vomiting.

XX.—OPTIC NERVE.

682. **Elschnig.** Coloboma of the optic-nerve entrance and conus inferior. *Graefe's Archiv*, li., 3, p. 391.

683. **Dor.** Perineuritic atrophy of both optic nerves after parotitis. *Ophth. Klinik*, p. 325, 1900.

684. **Muntendam.** Optic neuritis in chlorosis. *Ned. Tydschr. v. Geneesk.*, No. 17, 1900.

685. **Van Moll.** Optic neuritis in chlorosis. *Ibid.*, No. 23.

ELSCHNIG's (682) investigations, which are valuable particularly since they compare the ophthalmoscopic picture with the anatomical conditions, are based on six cases: 1. A coloboma of the disc downwards, in which, in the region of the coloboma, the sclera and choroid were poorly developed; the retina was wanting here, and in the neighborhood rudimentary retina had pushed in between the choroid and sclera. In the lower half of the nerve, nerve fibres were wanting. 2. Temporal coloboma of the disc with the retina folded into the choroid. 3. Temporal coloboma of the disc. In the thickened pial sheath of the nerve, to the nasal and temporal sides, cystic rudimentary retina was found. 4. A normally formed optic nerve with the same sac-shaped deposition of rudimentary retina between the sclera and the optic nerve. 5. Temporal coloboma of the optic disc. The coloboma lay in the dilated intervaginal space between the sclera-dura and the optic nerve. As in 1 and 2 there was a sac-shaped deposition of rudimentary retina in the choroid. The abnormal pushing out of the retinal tissue, which may be explained as being due to an extension of the margins of the secondary optic vesicle into the cephalic plates, prevents the closure of the fœtal cleft. 6. Conus inferior. In the region of the conus the sclera is covered only by rudimentary choroid and the intervaginal space is greatly dilated; in the lower half of the ball the sclera, choroid, and retina are much thinner than in the upper half. This differs from the marginal colobomas of the nerve, which represent either the remains of a fœtal cleft or, as in the cases mentioned above, a disturbed development of the cephalic plates (coloboma of the sclera or choroid), caused by an abnormal turning out of the margins of the secondary vesicle. In this case it is rather a hypoplasia of a portion of the bulbar wall, whose frequent location in the lower half is connected with the presence here of the fœtal cleft. This hypoplasia is expressed also in the abnormal extensibility of the ocular membranes, which is recognized ophthalmoscopically in the increased refraction of the portions of the fundus bordering the conus.

MUNTENDAM (684) has collected twelve cases of optic neuritis in chlorosis and adds a new case. A girl of fourteen had in the right eye a pronounced optic neuritis with numerous small hemorrhages, and in the left a similar though less pronounced condition. The condition improved under the use of iron so much that in three months nothing abnormal remained but the white color of the optic discs. JITTA.

VAN MOLL (685) describes a similar case in a woman of twenty-two. In this case also marked improvement followed the use of iron. JITTA.

XXI.—INJURIES, FOREIGN BODIES, PARASITES.

686. **Schroeder.** Three cases of shot injury of the eye. *St. Petersburg. med. Wochenschr.*, 1900, p. 474.

687. **Braunstein.** On traumatic injury of the eyeball. Six cases of extraction of iron splinters with the help of the electro-magnet. Charcow, 1900.

688. **Coppez** and **Gunzburg.** A contribution to the study of the diagnosis and treatment of intraocular magnetic foreign bodies. *Arch. d'opht.*, xx., No. 9.

689. **Brixa.** Injury of the eye from a flash of lightning. *Klin. Monatsbl., f. Augenheilk.*, xxxviii., p. 759.

SCHROEDER'S (686) cases were as follows: 1. A boy of nine shot himself in the right eye with a revolver, causing left hemiplegia, paralysis of the right oculomotor and left facial nerves, and phthisis of the right eye. The left eye was normal and had a normal field, indicating that the ball had struck only the anterior two-thirds of the posterior portion of the internal capsule, the posterior third containing the visual fibres not being injured. 2. A girl of eight received a revolver bullet in the right orbit obliquely from above so that the ball was scraped but not perforated. A condition developed similar to retinitis pigmentosa, followed later by atrophy of the optic nerve. 3. A neurasthenic man of fifty received some small shot above the left brow which led to paresis of all twigs of the left oculomotor. Skiagraphy revealed the shot on the frontal bone. A diagnosis was made of reflex paresis from concussion and a favorable diagnosis was made, which in fact was verified.

COPPEZ and GUNZBURG (688) report forty-one cases of iron splinters in the eye seen in Coppez's clinic in the last eight years. In eight cases a small foreign body lay anteriorly, mostly in the lens, and was removed with satisfactory result. If severe symptoms of irritation do not at once ensue, it is better to wait until the cataract is ripe and remove it with the foreign body. In the cases of foreign body in the posterior segment, the results were less favorable, particularly when the ciliary body or choroid was involved. To verify the diagnosis, Gérard's magnetometer was used and gave satisfaction, small splinters, however, must first be made magnetic. Among twenty-eight cases $v = \frac{6}{6}$ was obtained

once, good perception of light twice, preservation of the ball five times, and enucleation was done after unsuccessful attempts at extraction seven times, and once for sympathetic ophthalmia after successful extraction. In the eight successful cases, the splinter was removed twice through the enlarged wound. Enucleation was done in five cases because of severe inflammatory or glaucomatous symptoms. In three of these, the splinter had remained five, twelve, and thirty-two years in the eye without causing disturbance. In one case, the eye being enucleated for glaucoma with corneal ulcer, an unsuspected splinter of iron was found in the choroid. It was not encapsulated and had caused neither retinal detachment nor siderosis. Sympathetic ophthalmia developed in seven cases in from six weeks to fifteen years. In four cases there was sympathetic neuro-retinitis which was cured by early enucleation.

The prognosis depends upon the location and size of the foreign body and the length of time that has elapsed since it entered the eye. V. MITTELSTÄDT.

BRIXA's (689) patient was a telegraph operator who was injured by lightning while at work. In both eyes there was opacity of the anterior and posterior cortex of the lens, and in the left eye a small hypopyon. In the fundus of each side were masses of pigment in the form of little spots and larger clumps. Functionally, there was absolute paracentral scotoma outward and downward. Some months later the opacities of the lenses had increased. Since the scotomas did not correspond in position with the retinal changes, probably the nerve also was affected, although it was of normal appearance.

XXII.—OCULAR DISTURBANCES IN GENERAL DISEASES.

690. **Antonelli.** The ophthalmoscopic stigmata of hereditary and atavistic syphilis. *Rec. d'opht.*, xxii., 10.

691. **Derain.** Amblyopia and amaurosis following gastro-intestinal hemorrhage. *Thesis*, Lyons, 1900.

692. **Dolganoff.** A case of simultaneous menstruation from the vagina and the skin of the left eyelids.

DOLGANOFF'S (692) patient, a woman of twenty-five, had noticed regularly for the last four years that during her menstrual periods there was a trickling of blood from the skin or out of the sweat glands of the left lids. Otherwise the eyes were normal. The blood from the lids contained relatively few white corpuscles, whence the author supposes that the blood escaped by rhexis and not by diapedesis.

BOOK NOTICES.

X.—**Journal of Medical Research** (continuation of the journal of the Boston Society of Medical Sciences). Edited by HAROLD C. ERNST, M.D., 688 Boylston St., Boston, Mass. Vol. vi., No. 1. New series, No. 1. July, 1901.

This is a beautifully gotten up, profusely illustrated (xvii plates) volume of 297 pages. The journal will appear in irregular numbers—none less than 50 pages—as soon as material is on hand, a volume to contain about 500 pages. It will be supported by the American Association of Pathologists and Bacteriologists, the Boston Society of Medical Sciences, and other sources of strength. The present issue contains 27 papers, among which we mention a few to give an idea of the scope of the journal:

GEO. LOEB, Progressive changes in the ova in mammalian ovaries. The SAME, Transplantation of tumors (3 plates).

W. L. WORCESTER, Frequency of trichinosis in the United States (2 plates).

ISAAC ADLER, Primary endothelioma of lung and pleura (2 plates).

W. W. FORD, Classification of intestinal bacteria.

J. J. THOMAS, Cholesteatomata of the brain (1 plate).

CHAS. F. MARTIN, Some undescribed lesions in lymphosarcomatosis (Hodgkin's disease).

R. G. PERKINS, Nine cases of infection with bacillus pyocyaneus, etc. H. K.

XI.—**Studies from the Royal Victoria Hospital, Montreal.** Vol. i., No. 1. Ophthalmology 1. The Primary Intradural Tumors of the Optic Nerve (Fibromatosis Nervi Optici). By W. GORDON M. BYERS, M.D., Assistant Oculist and Aurist, Royal Victoria Hospital. The brochure just come to hand, issued August, 1901, is the first number of reports from the Royal

Victoria Hospital which by their nature and length are fitted for separate issue (separate copies $1), and is a very handsome monograph of 82 large octavo pages, on the optic-nerve tumors, with a synopsis of 153 cases, among them three new ones, which are described in detail, one particularly instructive on account of its intracranial connections found at the autopsy.

H. K.

XII.—**Essentials of Refraction and of Diseases of the Eye.** By EDWARD JACKSON, A.M., M.D., Emeritus Professor of Diseases of the Eye in the Philadelphia Polyclinic. *Third Edition, Revised and Enlarged.* 12mo, 261 pages, 82 illustrations. Philadelphia and London: W. B. Saunders & Co., 1901. Cloth, $1.00 net.

This is No. 14 of *Saunders's Question-Compends* and it is indeed an excellent publication, giving more thorough and detailed information than we are accustomed to find in a compend. It is essentially the reproduction in question-form of the subject-matter and thought contained in the author's popular text-book. For the student who has to pass his final medical examination, it gives too much, whereas a beginning specialist who has to undergo a competitive examination for the position of house-surgeon in an ophthalmic hospital could not have a better "quiz-master" to test his knowledge. The style is terse and clear, but requires a clever and rather well-informed reader to understand it all. It treats of refraction, the diseases of the eye, the injuries of the eye and orbit, the eye-symptoms in general disease, and the tests and requirements of vision for schools, railroads, and public service.

H. K.

XIII.—**Atlas and Epitome of Ophthalmoscopy and Ophthalmoscopic Diagnosis.** By Prof. O. HAAB, M.D., Zurich. Edited by G. E. DeSchweinitz, Prof. Ophthal. Jefferson Medical College, Philadelphia. With 152 colored lithographic illustrations. W. B. Saunders & Co., Philadelphia and London, 1901.

We have reviewed at some length, in vol. xxix., p. 457, 1900, this enlarged and revised edition of the German original when it appeared last year. As to the superior merit of Prof. Haab's work, we have to refer the reader to what we have said at the cited place. Suffice it to add that the book contains 80 pages of text on the theory and practice of ophthalmology, in all its bear-

ings, in very clear and comprehensive form, and a concise description of every one of the beautiful pictures. An advantage of this new edition is that it gives also a number of anatomical, mostly microscopic, drawings of the conditions seen in the living with the eye mirror. The English edition is, in style and typography, equal to the German. It is a merit of the enterprising editor to get this atlas into his series of low-priced and highly valuable hand-atlases. The book should (and can) be in the hands of every student and every practitioner who does not wholly neglect the eye. H. K.

OBITUARY.

We regret to chronicle the death of JOSEPH LE CONTE, Professor of Geology and Natural Science in the University of California. He was a man that combined a rather remarkable versatility of mind with an originality of thought, a carefulness in experimentation, and a lucidity of expression, that enabled him to write with authority and skill upon quite a variety of scientific subjects. His main contribution to ophthalmological literature was his masterly little treatise on Sight, published in 1880 and republished in 1897—a book in which the fundamental principles of monocular and binocular vision are laid down with admirable lucidity and precision and are fortified by the most varied and delicate, yet simple experiments, mainly of the author's own devising. So original is the work and of such substantive merit, that no one interested in physiological optics can afford to ignore its conclusions even when they differ from those of the great authorities.

A. D.

APPOINTMENTS.

Professor PANAS has resigned the chair of ophthalmology in the Paris faculty of medicine, and Dr. DE LAPERSONNE has been appointed in his stead.

Dr. S. BAUDRY has been appointed professor of the ophthalmological clinique at the medical faculty of the University of Lille, France.

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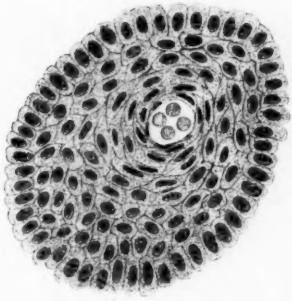

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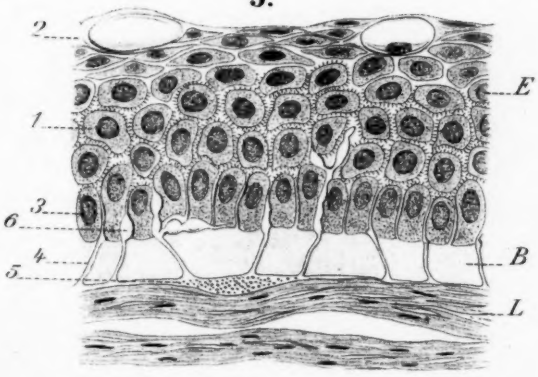

C. Krapf lith. Verlag von J. F. Bergmann, Wiesbaden.

Fig. 6.

C. Krapf lith. Verlag von J. F. Bergmann, Wiesbaden.